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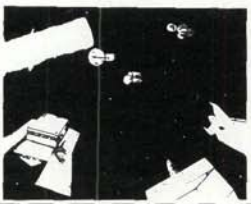

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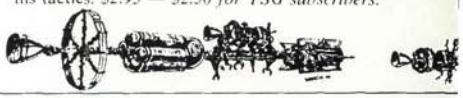

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beyond relativity

guest editorial
by G. HARRY STINE

The popular scientific publications in 1979 have bulged with a plethora of material commemorating the 100th birthday of the great theoretical physicist, Albert Einstein, born March 14, 1879 in Ulm, Germany. Great praise has been heaped upon this man whose sweeping generalizations attempted to tie together the mechanistic Universe of Newton with the electromagnetic and nuclear phenomena discovered in the 19th century. It is indeed unfortunate that a great deal of the information published in 1979's Einsteinian media blitz is either incorrect or misleading.

Yes, Einstein's work did indeed have a profound effect upon our conception of the Universe. And Einstein himself had trouble getting his work accepted in the scientific community. He was so successful at it, as a matter of fact, that a whole new cult of Keepers of the Faith have taken over and continue to look upon the Universe with the tunnel vision created by the blinders of their interpretations of Einstein's work.

Had Einstein not died on April 18, 1955, he would probably be greatly disturbed by the current state of affairs in modern physics. Indeed, he was upset about it as long ago as 1925. The man was a good scientist (and there are many good scientists out there today, in spite of what may be implied by this article). A good scientist is perfectly willing to modify a hypothesis to account for new data or even to completely discard a theory, no matter what it portends to his per-

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sonal philosophy, professional reputation, or standing in the scientific pecking order.

Were Einstein alive today, he would probably be encouraging theoreticians to go beyond relativity because modern physics is in a mess, to put it mildly. The Keepers of the Faith have been around for a long time; a couple of centuries ago, they exchanged their priestly robes for elbow-patched sweaters and chalk-dusted jackets. Today, the Keepers of the Faith will not permit anyone to question the theories of relativity, the constancy of the speed of light, or the space-time concepts of the Einsteinian Universe. They have also concocted the fiction that relativity is so difficult to understand that only a select few are qualified to interpret Einstein's work, and they hand down to science reporters (some of whom never bothered to take Freshman Physics 101 or, if they did, managed to flunk the course if they didn't drop it) only those highly over-simplified, non-mathematical summaries that support their own careers or, quite often, justify the personal or organizational philosophies or politics of the Keepers of the Faith.

This is no criticism of Albert Einstein but a mild rebuke at those who follow slavishly in his footsteps, being better politicians than scientists. It is a "mild rebuke" because it isn't going to shake the foundations of the temple; at best, it will be either ignored or quietly put down.

Einstein himself stated, "The General Theory of Relativity is as yet incomplete insofar as it has been able to apply the general principle of relativity satisfactorily only to gravitational fields, but not to the total field." If you back a physicist into a corner, you may get him to admit this...in private. Albert Einstein didn't have the Final Word about the way the Universe works, and he knew it. After announcing his sweeping concept of General Relativity in 1915, he labored for more than forty years thereafter attempting to tie everything back together in a broad, universal set of general field equations. His death left unfinished work; he did not succeed with his general field equations as he has done with his work on the photoelectric effect, special relativity, and general relativity. He died valiantly trying to make sense out of the view of the Universe that he had created because he knew of the discrepancies and data that did not fit. However, his contemporaries in general grasped relativity as the most rational possible approach to an understanding of the Universe; a great many Nobel laureates did not agree with this, but they found it extremely difficult to fight City Hall.

In the meantime, the Newtonian Universe that Einstein had put aside is alive, well, and working. Any engineer will tell you this. In fact, it took an engineer with great stature to openly criticize the current interpretations of Einstein's work. In 1962, Dr. Wernher von Braun said, "It is true that Einstein moved us substantially for-

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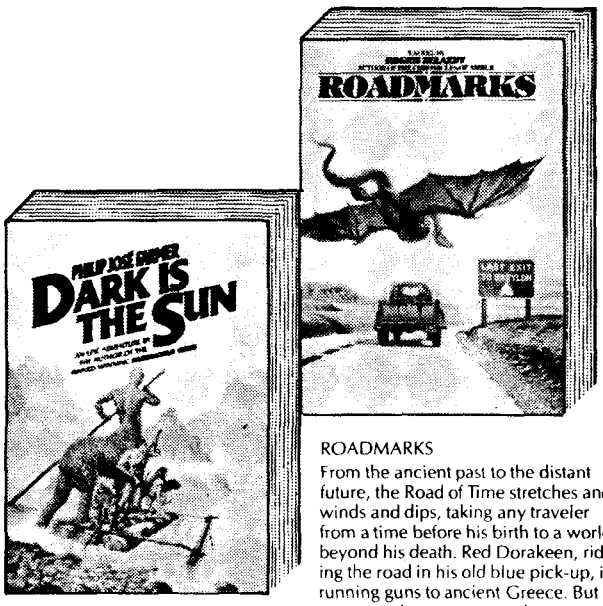

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ward and handed us jewels of understanding, but the laws of Newton still remain a more comprehensive statement of truth." Von Braun's life-long ambition which he fulfilled was to get human beings off this planet, and landing men on the moon was the proof that it could be done. Getting to the moon and back did not require the application of the theories of relativity, but the "ancient" Laws of Motion of Sir Isaac Newton. True, there may have been solid-state electronic devices aboard the Apollo spacecraft that depended upon the quantum nature of the photoelectric effect, and perhaps some clocks did not exactly agree after the flight...but the lunar landing missions could have been accomplished totally with Newtonian physics.

Such is not the case when it comes to interstellar flight. Interpretations of relativity handed down by the Keepers of the Faith deny mankind the stars because "it is impossible for any material object to exceed the speed of light." This bothers quite a few mavericks, including myself, who have taken the time to look into the situation and to acquaint themselves with the manner in which our current concepts of the Universe were arrived at. It also bothers the heretics that modern physics appears to have stumbled deliberately into the quicksand of incredibly untenable hypotheses and theories based on incomprehensible formulae calculated with micrometric precision from extremely vague assumptions based upon debatable figures obtained from inconclusive tests and quite incomplete experiments carried out with instruments of problematic accuracy.

First off, "Science" isn't what most people believe it is and is not what they have been told that it is. The general public is taught that the discoveries, laws, theories, and hypotheses of "Science" are hard-bound truths set in the firmest concrete. In nearly all junior high school, high school, and undergraduate science courses, the structure of science is presented as a firm and unequivocal set of absolute truths. Facts are set forth in firm terms with no room for doubt. It is only when a person gets to graduate school that he begins to learn that the world of modern physics is becoming a messy morass.

The monumental edifice called "Science" which appears to be so solid and substantial when viewed from a distance turns out, upon closer inspection, to be a cracked, crumbling, eroding, sagging, ill-fitting pile of randomly-shaped pieces resting precariously on a highly fluid foundation of clay made up of constantly-changing theories. There are great, gaping holes in this structure, and some scientists spend their entire careers attempting to plug these holes with paper. The modern physicist is also very insecure because he is plagued by nagging doubts due to the appearance that nothing is known for certain and that, under some conditions, some things are more certain than others. Well-known laws of

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nature that engineers use daily to design and build structures and vehicles for a working world are, to the modern physicist, only partially-confirmed hypotheses waiting to be replaced with somewhat better partially-confirmed hypotheses. The modern physicist runs scared; at any time, some new finding or some new interpretation of experimental data may render meaningless a decade or more of his own work, thereby costing him his reputation and stature among the Keepers of the Faith.

Some scientists couldn't care less and are intelligent enough to remain flexible, choosing to ignore the statement of Dr.Theodore von Karman, "A scientist is permitted to have one good, original idea in his life; a genius is permitted to have two." Nobody ever asked von Karman who gives the permission. I know a lot of people who have had dozens, and they have published papers, patents, or a large bank account to prove it.

In 1962, Dr. William O. Davis presented an extremely rational definition of what we really mean by "Science." He stated, "Science must be a series of successive approximations to reality."

Einstein himself subscribed to this school of thought. In 1917, he said, "No matter how we may single out a complex from nature...its theoretical treatment will never prove to be ultimately conclusive...I believe that this process of deepening of theory has no limits."

Keeping these thoughts in mind, we therefore need to look at how we got into the mess we're in with modern physics and then consider how we should go beyond relativity which denies mankind the stars on the basis of intuition alone.

I want to point out again that I am not criticizing the Scientific Method. It happens to be the very best method of problem solving that the human race has invented thus far. When properly applied, the Scientific Method yields spectacular results. It is only when users attempt to twist it and subvert it to their emotional or irrational whims that it becomes no better than any other classical approach depending upon the frailty of juvenile human emotions. This is exactly what has happened with relativity because Albert Einstein's personal and philosophical views, apart from his genius as a theoretician, made him a favorite among liberal intellectuals, writers, editors, and publishers—not only those who publish the textbooks and the scientific journals, but those who can make or break a person's reputation in the media. This is also not a criticism of Albert Einstein; it was not his fault that others promoted and misinterpreted his work which formed an important bridge between the mechanistic Universe of Newton and the "field Universe" of today.

The way that all of this developed and then degraded into a Universe right out of Lewis Carroll is a fascinating study of human rationalization. As Robert A. Heinlein pointed out, "Man is not a rational animal; he is a

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rationalizing animal."

Although many "national philosophers" preceded him, it was Sir Isaac Newton who provided us with our basic, everyday working concepts of the Universe. In 1687 in England, Newton published a three-volume work entitled *Philosophical Naturalis Principia Mathematica* with the financial support of Edmond Halley. It was in Latin, which was the universal language of both science and art then; today, the universal language of science is broken English. Few physicists have ever read what is known as "The Principia" in the English translation, let alone in the original Latin, and they know Newtonian physics only through interpretation by others. Newton's work is not theoretical but was derived by him directly from observation of the motions of the planets of the solar system with the instruments that he had available to him at that time as an astrologer... there being no astronomers yet. His famous workable three Laws of Motion provided the breakthrough necessary to develop the working rules of the mechanistic, "clockwork" Universe. The first two books in the trilogy were the result of nearly twenty years of consideration of astronomical observations on Newton's part. The third book contains Newton's only intuitive discovery, his Law of Gravity. He could write the equation describing the motion of celestial bodies as a result of gravitational fields, but he was unable to determine the *nature* of the gravitational field. Yet this Newtonian Law of Gravity permitted us to measure the solar system and to travel in it.

Newton recognized that he had made a synthesis based upon the findings of others. He was an educated man and was in correspondence with other educated men in Europe at the time. He certainly knew of the work of other observers and of Gallileo's work although he may not have come into possession of an English translation of Gallileo's work until after the *Principia* was published. According to Newton, "If I have seen further than other men, it is because I have stood upon the shoulders of giants."

Newton's work remained supreme for three hundred years and continues to reign in engineering and technology today. But in the 19th Century, other "natural philosophers" began to suspect that something was awry with Newton's mechanistic Universe. Observations made with better instruments were not precisely matching Newtonian predictions when it came to being able to carry them to several more decimal places. And totally new phenomena were being discovered that were not covered by the principles of Newtonian physics.

The big problems revolved around electricity and magnetism.

Both an electric field (produced by the existence of an electrically-charged body) and a magnetic field (produced by the motion of an electrically-charged body and its electric field) could create "action at a distance."

(continued on page 159)

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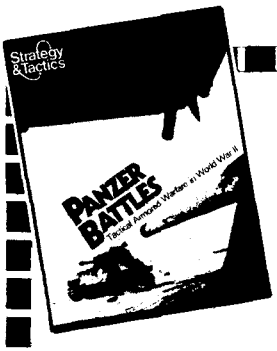

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phoenix

A communication gap is to be expected between man and alien. But there may be more to it than meets the eye . . .

by MARK J. MCGARRY

"Knowledge is our destiny."
—Jacob Bronowski

In the spring and summer of his life, Lawrence Tollens had lived in the city of Salton. He carried with him his memories of his parents, who had never given him up to the government, but raised him themselves; of their house, and in it his books and his dog (a possession even more rare than parents); and most of all, Will, and dreams.

He remembered the day William had left.

Lawrence Tollens had been eight, then; not old enough to fully understand what was happening, or why, but not old enough to have become insensitive to the conflicting emotions that charged the air in the living room

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of his parents's house. The forces centered on William Evers, who looked harder, somehow, in his cream-and-sienna uniform, his face set in a smile that was more a rictus than an expression of happiness. Evers was glad to be going, yes: all the city of Salton knew how he had gone through or around every barrier that had stood between him and a commission in the StarForce in an amazingly short period of time. He was something of a phenomenon. He was rated for active duty out-system, a goal he had attained with style. But now was the time for leaving. Lawrence Tollens could almost see the pride tugging his Uncle Will in one direction, and his family ties holding him. But these were tearing now, and it was painful for him, for them all.

Lawrence's father and mother were waiting outside, in the freewheeler his father had rented for the day just to take Will to the airfield. They would make their parting there. This was Lawrence's time.

"You keep reading those books I've been giving you," Will said, shattering the heavy silence that had grown between them in the last few moments. "There are some things in those books that aren't taught anymore, but that doesn't mean you shouldn't know about them. And you won't find many books like those around anymore. Everything is tape

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now, or cubes. I've always liked the smell of old binding glue. You?"

Lawrence nodded, smiling. The smile only went as deep as his lips. He wanted to let Will know how unhappy he was, but he wouldn't let himself put any more guilt on him. Besides, Uncle Will must know how Lawrence felt. He always did.

"Yeah," Will said. "I'm going to find a lance and be Don Quixote. You haven't read that yet, have you?"

"No, Will," said Lawrence. There were a thousand books in his room, all gifts from Will. Lawrence was the only other one in the family that shared Will's passion for the word.

"Lawrence," Will said quietly, "I've been working ten years for this, in one way or another. Now I can go out-system, and I'm going to. But I'll be back. You know I will." He stood. "Take care of yourself."

"I'm going to miss you," Lawrence said, standing. To his own ears he sounded very adult, very calm. He held out his hand, and Will shook it. "Baskerville will, too."

"Yeah, you take care of that old dog." And he nodded curtly, and put his hat on his head and left without saying good-bye. That would have been asking too much.

Fifteen years older than Lawrence Tollens, Will had been more an older brother than an uncle. He had joined the Force at the minimum age, and clipped two years off the usual training time. He had headed out, and come back with souvenirs, permanent psychosis, and a discharge, all in five years. Will had stopped doing things fast after that; he had stopped doing most things for himself altogether. He had come back to see Lawrence and his parents just once after his return to Earth. He had been blank-faced and stoop-shouldered, and every movement seemed to have been preceded by careful—and slow—deliberation. Tollens nearly had not known him. Will seemed not to have recognized him at first, had said hardly a word to Lawrence's parents, and had cried when Lawrence told him Baskerville had been killed two years before. Will had been accompanied everywhere by an attentive, burly male nurse who must not have been so attentive, a month later when Will had dived from a fifth-floor window and added paralysis to his catalogue of pain and injury.

No one really knew what happened to him out there, out-system. There were a lot of theories, but no one connected with the Force seemed to care enough to prove or disprove any of them. There was a war on, after all, and individual concerns had to be set aside for the greater good, whatever that was. The war was still on (as much as it ever was), fifteen years later.

I

Morgan's World was the second world of six in the family that circled Epsilon Eridani, eleven light-years from Sol, an instant by Impellier cruiser. She revolved six-tenth of an astronomical unit from her primary. Her mass was half again as great as Earth's, great enough to hold a dense,

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oxygen-poor atmosphere. It was a hostile planet, but with his machines Man could settle there. The orbit of Morgan's World was a long ellipse. At aphelion, she was ninety million miles from her sun. Axial tilt was only seven degrees: it was that orbit that provided her with what passed for seasons. In perihelion-summer, the carbon dioxide boiled off the polar caps and stirred up winds that gusted to two hundred kilometers per hour. In aphelion-winter, everything was dead and still, except for those few species of animal life which did not hibernate, and lived either on each other or the warm bodies of the hibernating species which they found. There were two growing seasons, sandwiched between the summers and winters, and it was only then that the life that had adjusted so well to this hell truly flourished.

Lawrence Tollens had arrived in the spring, but he had been too busy to appreciate it at the time. Now, winter was coming.

Tollens awoke, cold and uncomfortable, in the washed out, pre-dawn light. Automatically he fumbled for the covers in which Daryl had wrapped himself, then stopped, sat up. A recorded voice was saying, "Time to rise, sunshine; time to rise, sunshine," and Tollens staggered to his feet and hit the cut-off on the datalink before the computer could become belligerent.

He stood and stretched. He was a tall, spare man, with short, reddish-brown hair. (It had been clipped for the passage to Morgan's World six months ago, and it grew back slowly.) He was twenty three and already a Forcer, an ensign with an out-system stamp on his papers.

He showered. Then he got into his quilted StarForce uniform, with the heavy utility belt and the batteries which powered his heaters. He slipped on splay-soled sand boots, and slung his respirator across his chest. He hung his gloves and face-mask from his belt and shoved its ear-pieces into his pockets. Those would provide protection against the subsonic vibrations emitted by natives when they vocalized which, unchecked, had severe depressive effects on the human nervous system, even over a short period of time.

Tollens walked the hundred-odd meters of tunnels from his quarters to the garage. The place was chaotic.

He immediately revised this judgment. Actually things weren't that bad, but after months of a precise, clockwork routine, any variations from the schedule came as a shock. When Tollens reached the garage, he found the entire workshift of fifty men milling around, instead of ranked next to their tractors, graders, and ore-carriers, ready to leave for the morning's excavation work. He shrank back from the entrance and gathered himself before he went in. It took him several minutes of mingling and shoving and being shoved to find someone he knew well enough to speak to.

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"Lieutenant Keville," he said, "I just got here, sir; can you tell me—"

"Not now, Tollens. Does it look like I have time to—" And turned away. Then turned back. "Wait a minute. Tollens, I want you and somebody else—I don't care who—to take a car and go out to Village Alpha. Find out what's going on, and then report right back. Don't take more than two hours. I've got to make some sort of report on this."

"On *what?* Sir."

"Our shift-supervisors went out to the construction site an hour ago, and there was nobody there. No one knows what happened to our native help, and what are we supposed to do in a situation like that? Canestrari! Come here, you're going with Tollens...."

There were schedules to adhere to. Someone at Force HQ on Luna had decided that Epsilon Eridani was of strategic importance, and that the two hundred man outpost on Morgan's World was not enough to secure the system. So, three kilometers to the east a small city was going up, the nucleus of a fully developed spaceport and defense center. Or had been going up. Conveniently, when humankind had arrived there had been an indigenous, intelligent race on the planet. They were sufficiently intelligent—and alike to mankind in intelligence—to understand the concept of trade, and sufficiently primitive to desire what goods the Force could furnish them, for services rendered.

But now the services weren't being rendered and Tollens and Canestrari, a short dark man he did not know, rode the slewing, bucking ground-car over low, scalloped dunes and left flattened rooster-tails of dust in their wake. The impression of speed was totally illusory, a product of low elevations and a distant horizon. Land vehicles couldn't manage much better than thirty kilometers per hour in this terrain, and under Morgan's World's heavy gee-force.

"Did Keville say your name was Tollens?" Canestrari shouted through his respirator's face-mask.

"Lawrence W.," Tollens acknowledged.

"Yeah, I've heard about you," said Canestrari after a moment.

"So what did you hear?" said Tollens, also after a moment. He hadn't known what to make of that.

Canestrari was silent for such a long time that Tollens thought he had not heard. Then Canestrari said, "You're real friendly with the natives, aren't you? I mean, that's why Keville picked you. Watch out for the sand-mob, there."

Tollens slowed the car so a crowd of round, furry animals on two stubby legs could waddle and roll across the sand in front of them. Sand-mob was the registered name for them, but men at the outpost called them either 'dums' or 'dees,' according to preference.

"Why did he pick you, then?" Tollens asked, swerving around the tail end of the mob.

"I was standing in front of his finger when he pointed," and they

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both laughed a little at that.

But Tollens found himself a little angry—and then he became angrier, this time with himself for feeling the emotion. He knew he had developed a reputation around the outpost that had developed from his work with the natives. He worked regular shifts like everyone else, but a few hours a week he gathered samples and ran tests for Captain Goldberg, the outpost's life-sciences specialist. On top of that, he spent many of his off-hours around the villages. He had acquired a reputation for being at best a snob, and at worst a misanthrope. That was wrong, of course, but Tollens did not care enough about anyone else's opinion to correct it.

Village Alpha was, of eighteen the Force dealt with, the closest to the outpost. After twenty minutes of hard driving Canestrari shouted, "Look!" and pointed. Tollens could see a cloud of dust rising to the north of the village.

"Damn," he said. "It looks like something out of *Anabasis.*" It was a migration. It looked as if the whole village was on the move. The bipeds glided across the sand on their wide, padded feet, looking absurdly like a Ziegfield chorusline as they dipped and weaved and—at each twelfth step—pirouetted in unison, all the time moving forward, more or less, out of the village.

"They're crazy," Canestrari said. "The whole town's gone crazy."

Tollens stopped the car a few dozen meters outside the village and climbed out of the cab. He saw Canestrari fumbling with the clips that held a carbine to the underside of the dash. "Leave that," Tollens said.

"We don't know what they could do when they're like that," said Canestrari. But he replaced the rifle.

"It looks like another of their rituals. Stay calm."

Before he walked between any two of the lozenge-shaped huts and actually entered the village, he did the short dance-step which was the ritual of entry. Canestrari followed him, looking at Tollens curiously as if at any moment he too might take up the villagers' buck-and-wing.

"Do you know Ameslan?" asked Tollens.

"What? Oh, some. I never really caught on to it."

"Go to the head of the column and see if you can get someone to talk to you; maybe you can even get one of them to come back to the outpost with us, so that we can get this thing cleared up."

"What if they don't want to come?"

"Don't force them. While you're doing that, I'll see if anyone's stayed behind."

Canestrari looked longingly back at the ground-car and its rifle, but he trudged off after the column.

Tollens waited until he was out of sight, and then went to a hut on the other side of the village. He walked down a short ramp to its sunken entrance and made an extended set of ritualistic hand signals before he went

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in. There was a switch-back that kept the wind from the interior. Inside, it was dark. Tollens made a low-pitched animal sound in his throat.

No answer. Disappointed, Tollens turned back to the entrance and then recoiled, startled.

The being in the doorway came to Tollens' shoulder. The articulation of its legs, similar to those of a dog, gave it a stooped-over appearance. Only a great curvature of the spine permitted it to stand erect. The arms were oddly jointed and so long that the native could, if it wished, walk gorilla like on all fours. Their forelimbs possessed hands with two digits, the outer two of which were opposable. Their bodies were covered with ruffled fur to retard heat-loss, and their heads were wolf-like, with a super orbital bulge that curved out to accommodate a brain as large as a human's, and in many ways more developed. Their biochemistry was analogous to more familiar, terrestial forms of life. Their blood was warm and iron-based. Though they were not oviparous, they had been in recent geologic time; the females possessed vestigal nipples, the males none. In the darkness, Tollens could barely see the canine snout, and the jaws that moved with that disturbing, side-to-side sawing motion. The teeth were actually serrated ridges of tough bone.

"Dancer?" Tollens asked. He still had difficulty discerning between individuals, and even between sexes.

The native nodded, not a gesture natural for it, but an affectation it had acquired though its contact with humans. It held up its hands before Tollens' face and made the sign for its name with its fingers. Had it spoke, Tollens could not have heard without bulky equipment to take the subsonic frequencies and pitch them into the audible range. Sign language, used on Earth for centuries but now largely obsolete, was simpler and more efficient. And the natives seemed to enjoy using Ameslan, perhaps for the experience of having found ways to move their fingers in meaningful patterns. Patterns and ritual made up the roots of their society, as technology and intellectualism was the basis for the society of Triumviratine Earth.

Waited, the native signed.

Tollens nodded. He simultaneously said, and signed in Ameslan. "I'm glad you did. Where's everyone going?" His Ameslan was imperfect, as was the native's understanding of spoken English. They had, in the beginning, adopted this method of communication as a compromise, after several weeks of mutual frustration.

Cold.

Tollens puzzled. "You're leaving because winter's coming?"

No. Return.

"You're going to return?"

Yes, the native signed.

"When?"

When we are finished. When I am finished, the dancer signed.

"I don't—" Tollens listened. In the dry, thick air, he could hear Canestrari calling. "This isn't going anywhere, Dancer, or at least not fast

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enough....I don't understand what you mean. Can you explain to me later, when we have time? There's someone else with me, and I don't want him to—I want to talk to you alone."

The dancer made the sign of acknowledgement.

"But will you be here later? Or are you leaving, too?"

I am leaving.

"Damn."

See me at Theta, when the sun is high.

"Today?" No, that was impossible. It was mid-morning now. "I don't know if I can make it up there tomorrow."

I wait three days.

"Tollens!" That was Canestrari.

"I've got to go," said Tollens. He sprinted away from the hut but too late, Canestrari had already seen him.

"What were you doing in there? Find anyone?"

"A dead one. Natural causes, it looked like. I hope they get back soon, while there's still something left to bury." His ruse worked. Canestrari turned his back hastily on the hut.

"Did you find out anything?" asked Tollens, as they started back to the car.

"I found out that you can't 'talk' with these damned gloves on—or at least I can't. Besides, talking to these animals is like talking through a wall. You can't hear much of what's happening on the other side, and you can't be sure of what you do hear. I wish the hell they were smarter. It's a frustrating situation."

"They're the ones that learned our language, both English and Ameslan," Tollens pointed out.

"Not well enough," said Canestrari. "Hell, you're right, but that doesn't help us. I couldn't get them to stop that pavane long enough to tell me anything. Keville will break us, and I don't know what Commander Pratt will do when he—"

"I don't think it's that serious." said Tollens. Actually, he was not sure of just how serious it was. He had no idea of how Commander Pratt would react to the news that construction would be stopped dead for an indeterminate length of time, for an unknown reason. "They certainly can't hold us responsible," said Tollens. "Besides, I think this may have happened before."

Canestrari looked at him. "Yes? Not since I've been here, and that's been eleven months."

"Years ago," Tollens told him. "The second expedition reported something like this—the natives all disappearing one day. They came back, but no one was sure just how long they'd been gone. The crew wasn't sure just when they'd left."

"Fine. That will reassure Keville, I'm sure."

Tollens continued. "That is, if this is the same sort of thing that happened before." He looked up. Epsilon Eridani was a dull orange ball, halfway up the sky. "Sun dogs, up there. That means bad weather."

Canestrari shielded his eyes as he

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looked eastward. "It does look like a storm coming up," he agreed. "We should be getting back."

II

"Brood too much," said Daryl Jabaut, in an accent which Tollens had never been able to place. "Not healthy for you, should come out with me. Do up the town."

Tollens swivelled his chair away from the window. "I'm not brooding, Daryl, just thinking. And somebody packed up your town and took it away during the night."

"Sure," Jabaut chuckled. He was a big man, nearly two meters tall, with a Mediterranean look about him. Tollens felt sure he was at least fifty, but he was in excellent physical condition. His laugh was like a landslide rumbling. "What're you thinking about? Your uncle again, maybe?"

Tollens nodded. "I've got a request in to Commander Pratt. I asked him for permission to conduct a behavioral study of this migration. If I can get his permission to go up into the hills, I can find out what this is all about."

"That important to you?"

"It's the only reason I'm here, Daryl."

"So what do you do when the reason's gone?"

"I guess I go home, then," Tollens said.

Jabaut shook his head. "You've got thinking to do, Larry," he said. "So what're you going to do if Pratt turns you down?"

"Do you know who Captain Goldberg is, Daryl?" Tollens asked.

"Heard the name."

"He's the only life-sciences man the Force has on the entire planet, him with two meteorologists and a geologist...which shows what they care for anything that can't be sighted down or detonated. But I'm going to see him at 14.00. I've heard he's a friend of Pratt's. If I can get him behind me, I think I can get Pratt's chop on my request."

"Better fly, then. Five minutes to fourteen now."

Tollens bolted out of his chair. "Damn!" He dashed out the door. Jabaut got up and shut it after him.

Pratt had allowed Captain Goldberg a section of corridor for his laboratory. Goldberg had installed heavy fabric curtains at either end of his workspace, but these did little to reduce the heavy, pungent odor from the specimen-cages's ventilators. Tollens sneezed as he entered the lab. It smelled like a handful of cinnamon held directly under his nose. The left third of the corridor had been left clear for through traffic, but the rest was a confusion of tables, cabinets, and shelving. Goldberg's instruments, and the animal cages and herbariums, were pushed up against the wall.

"Captain?" Tollens said. There was a mumble from the back of the room. Tollens stepped completely inside and let the curtains hiss shut behind him. He went to one of the cages and peered inside. There was a thin layer of frost around the sealed

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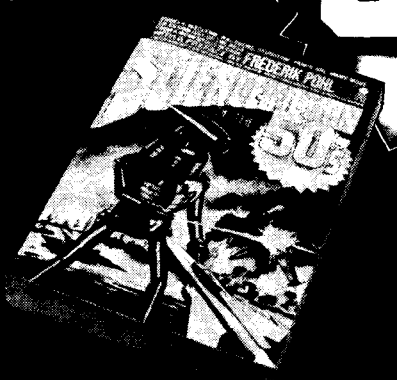

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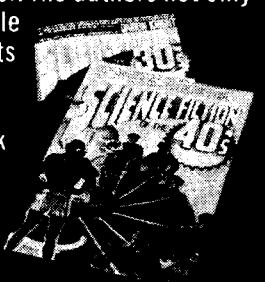

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edges of its transparent face. Alongside it, a refrigerating and air conditioning unit hummed. Inside the cage was something furry that resembled a *sleeping, curled up cat. It had four* legs so short that it looked much as it did now when standing. Tollens tapped the temperature gauge on the glass. "Isn't it a little cold in there, Captain?"

Goldberg wiped his hands on a rag. "Simulated winter conditions. The temperature will drop even lower than that during aphelion-winter."

"When's that?"

"When it starts is arbitrary. We'll be at aphelion in—" He thought. "Seven weeks. Something like that, or at least that's what the datalinks tell me."

Goldberg, a short, dark-skinned man only a little older than Tollens, was always pleasant. He could not help but be flattered by anyone who showed an interest in his work.

"Are your test animals reacting to the cold?" asked Tollens.

"Reacting, yes," said Goldberg. "But in the laboratory, I'm not finding out anything conclusive. This one here—" He tapped the cage Tollens had examined. "—is typical of most. When I began to lower the temperature, its appetite rose. Then it became sluggish. At that point I raised the temperature for five days, and it became erratic in its behavior, irritable. Now the temperature is back down, and you can see it's torpid once again. That seems to indicate a hibernation period—but without field work, it's very hard to be sure."

"It could be a function of the temperature, and not the season. Maybe they get torpid whenever *there's a cold snap. Like reptiles,*" said Tollens.

Goldberg nodded. "Or the beast could be diseased. I wish we had the equipment and personnel for good field work. The mission to Eta Cassiopiae has better equipment than we do, and there's no indigenous life in that system more advanced than a protozoan. I have to be satisfied with this, and going out to the villages twice a month for interviews. . .if I can find the time. You have been a big help, Lawrence. I want to tell you I appreciate it."

Tollens nodded, uncomfortable. He said, "You've heard about the migration out of the villages? It's complete now."

"So I heard. That *must* be tied up with aphelion-winter, somehow." He sighed. "Too bad no one thought to get film of that. I hear it was some dance they put on. I asked Commander Pratt to detail one of our aircraft to survey the area, you know. I wanted to see if this was only a local phenomenon, or if it occurred across a larger area. He said Luna wouldn't approve such an expense, which meant he wouldn't. One can't help but wonder where their priorities lie. This is supposedly a contested system, and not only do we lack defensive capabilities at this point, but the planet itself is largely a mystery to us. And the situation isn't likely to

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change, I'm afraid. There's a new set of statistics out: home-system defense is up another seven percent of the Force budget."

"That pushes it up over ninety, doesn't it?"

Goldberg nodded.

Tollens didn't give a damn about misappropriations. Keeping the impatience from his voice he said, "I came to talk to you about the migration, sir. I thought perhaps you might like that studied—find out exactly where they've gone, and what they're up to. It can't help but supply valuable information for us."

"That presents some difficulties, as you can guess. I doubt if the Commander would approve of my zipping around in the foothills in a groundcar, for one. I had enough difficulty getting permission for those field trips into the villages."

"I was thinking of doing it myself, Captain. With construction of the base stopped right now, and mining, I'm sure that if I left no one's workload would be increased."

"But you have no formal training."

"I can at least observe, and that must be worth something."

Goldberg looked doubtful, but he said, "What is it you want me to do?"

"I thought perhaps if you spoke to the Commander, he might be more receptive to the idea. I've already filed the paperwork for a formal study to be made."

"When was this?"

"First thing this morning."

Goldberg rubbed his cheek reflectively. "I don't know how much influence I would have, Lawrence. Not much, I'm sure."

"But you'll try?"

Goldberg nodded. "Who knows? If you can get permission, it might set a precedent. We might start getting some real work done around here. The situation now is ridiculous, simply ridiculous. These natives are an amazing anomaly, they should be studied. I wouldn't go so far as to say they are higher than we are on the evolutionary scale. But they are better designed than we are, physiologically, in a hundred ways."

"It's true their young emerge from the womb more developed than a human child," said Tollens. "But that is less advanced, isn't it? The lower one goes on the evolutionary tree, the more complete Terrestrial young are at birth."

"As a general rule, that's true. In Man, we survive largely because we acquire somatically information or abilities which we lack, genetically. Intellect, not instinct, is the rule with us. But the genetic material of life forms on Morgan's World differs subtly from ours. This is most readily apparent in the natives—their genetic material can be modified very quickly. They have little use for somatic information. They have instincts for skills humans must labor years to possess. We spend twenty years just learning how to think properly; the natives are born, readily able to communicate and interact with the rest of their society."

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"Then incomplete development of the fetus inside the womb would just be a handicap, as it is for lower forms of life," said Tollens.

"Not only is the development complete *in utero,* but there is a brief period, for a day or two prior to birth, when the fetus is living independent of the mother's circulatory system. By our standards, that is a devolution to the egg-laying stage. Here, it is a progressive development. They emerge from the womb with the rudiments of language and tool-making. They are self-sufficient, physically. And just one anomaly is: With that sort of evolutionary advantage, why are they so primitive socially and technologically?"

"Primitive by our standards," Tollens admitted. "But maybe their way is better, more efficient. It follows the line of least resistance. They have a hunting/gathering society, but unlike humans, they will never *need* to develop agriculture. Their population is stabilized just at the capacity of the land to support them, or a little below. They have tools to make their lives comfortable, at that level of development. It is as if they had a knowledge of all types of tool-making and selected only what few things they needed. Their technological development is a breach of everything we know about the subject from our own history. They smelt iron, but they also extract magnesium from magnesium chloride—something we never did until the late nineteenth century. Yet their most advanced weapon is the bow. They aren't getting caught into the spiral that we did, when technology allows the population to expand to the point where more technology is needed to support it. Agriculture was the first step in a line that has brought us directly here, in a faster-than-light ship. They are not fighting against their environment, they are one with it. I think there is something we can learn from their philosophy."

"It's not philosophy, Lawrence, it's biology. But I admit it does have an attraction, from more than one point of view. But there's no more point to admiring their 'unity with nature' than envying the patience of a snail. One, like the other, has no choice. And because they have no choice, sometimes I can't help but regard them as...animals."

"You can speak to them."

"I can speak with a chimpanzee, too, and also in Ameslan." Goldberg waved his hand. "I've got work to do now. But I will talk to Pratt, as soon as I'm through with some tests I'm running, and good luck to both of us."

Tollens smiled in thanks, and left. He went back to the quarters he shared with Daryl Jabaut. Jabaut was getting into his out-suit. "I doubt if you'll be needing that," Tollens said. "You won't be getting much work done without native help."

Jabaut shrugged. "Still have to show," he said. "We're behind on zinc and magnesium quotas. Might be able to get some work done on that." The construction work was being

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done in a mineral-rich area. The engineers were taking the opportunity to stock-pile minerals which would be used by the permanent base, when it was completed. "Talk to Goldberg?"

"He'll talk to Pratt for me."

"Good. But don't get your hopes up there. Expect the worst; always be pleasantly surprised."

"I've heard that before," said Tollens indistinctly.

"Never said I was original, just sincere." He looked at Tollens. "Anything bothering you?"

"If you do get out to the site, keep a look out for any animals, will you?"

"Sure. Why?"

"Because I didn't see many when I went out to Alpha yesterday. Goldberg has a hunch that they might be starting to hibernate."

"That, or migration, right? What did Goldberg have to say about it?"

"Not very much. He doesn't have enough information, he says. Sometimes I'm not sure he knows anything about this world," said Tollens.

"He should be different from the rest of us? All they know is this is where we build, so we build."

After Jabaut left, Tollens went to the window and stared outside. About an hour later, the datalink buzzed for his attention. He slapped down the *accept* toggle. The wall-screen cleared; it was Captain Goldberg.

"Lawrence? I talked to Commander Pratt about your idea. He... told me he was going to turn it down, as soon as he got to it. I'm sorry. Right now he's more concerned with how he is going to explain the delays in construction to Force HQ."

"I think the two go hand in hand."

"I pointed that out to him. But apparently he doesn't see it that way. I do have a suggestion for you, though. Go over his head. Write out a dispatch to headquarters now, and ask them for permission. It's a long chance, but if they turn you down you'll only have wasted some of your time. Use my clearance with the communications officer and he'll send your message out on the next trans-light pod; you'll have a reply in a day or two. But again: do not get your hopes up."

They both knew how unlikely it was that Force HQ would override an officer in the field on a local matter.

"Thank you, Captain," Tollens mumbled. He blanked the screen numbly, like a sleepwalker.

He saw himself as having one reason for being here, and one reason alone. Will had lost his sanity on this planet. Tollens knew the answer was somewhere in the hills. He had come a dozen light-years, only to be turned back a hundred kilometers from his goal. He raged at the thought of being frustrated now, so close to the answer he sought.

III

Tollens remembered.

Blinking away the film of tears.

As a child, helping with small hands to dig Baskerville's shallow grave; the dog had been struck by his father's transpill one inappropriately bright spring morning. He heard, in the

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nights that followed, the wet/soft impact of the acrylic body of the car against the yielding flesh, and then the inhuman—but mercifully short—scream. But never, never, being able to bury the memory.

It had been a long time ago.

"Second thoughts?"

Tollens looked away from the window. Mandragora tea sloshed heavily in his cup and trickled onto his fingers. He transferred the cup to his right hand and rubbed the left absentmindedly on his pants.

"Don't know how you can think of leaving all this picturesque scenery," Jabaut said. He hunched his shoulders and stared at Tollens over his ham-and-cheese sandwich. He sat in a chair with his feet up on a wall-shelf. "People have no appreciation for raw, natural beauty."

"It's raw, all right," said Tollens. Outside, past three thicknesses of insulated plastic, the wind was blowing at over a hundred kilometers per hour. The storm was in its third day. Dust and sand obscured the view outside the window totally, and Tollens saw only a shifting blanket of brown and rust red.

"Are you having second thoughts?" Jabaut repeated.

"No." Tollens sipped. "Thinking about something else. No, Daryl... I've decided to leave. I don't want to stay now."

Jabaut put the rest of his sandwich in his mouth and mumbled around it. "I'll probably be here for the rest of my life. Here, or someplace just the same. Me and the Force get along pretty well—much as we both hate the arrangement. Like being married. Never married, were you?"

Tollens shook his head. He had never thought much about it.

"I was in a quad, once. Me, two men, woman. Was the woman that busted it up, though she said it was me. Messy, not good. Like the men, then, I did, and she didn't like the competition. Crazy woman." He laughed.

"When was that?" Tollens asked. Outside, the wind bellowed. He felt his shoulders tense, unconsciously expecting the animal wind to rend the side of the cabin and claw its way in at him.

"Years ago, before I joined up with the Force. Probably when you were playing 'doctor' in the backyard." Jabaut made a disgusted sound. "Listen to me trying to fill air. It's none of my business, Larry, what you're doing, but I think it's a mistake; wouldn't feel right letting you do it without me saying anything. You went through classes, training. landed here in three years. Shows some kind of potential, and there're worse places to use it than Force. But none of my business. What if I did change your mind, and turned out you were right?"

"It's all right," said Tollens. "You shouldn't be afraid to say what you want to."

"And doesn't matter anyway because you're not listening, right?" said Jabaut.

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"I'm listening. Daryl. But I won't change my mind. I'm resigning my commission."

"But that dispatch you sent to Luna—"

"That's a million-to-one shot. No, I've faced the fact that I won't be able to go."

"So turn your back on the whole Force? Waste. You're saying to me that three years of your life were for nothing because you can't go up in those damned hills, when you came this far."

"That's right."

"That's *stupid.*"

"That's the way it is." Tollens turned back to the window. "Believe that, Daryl, and it'll make things much easier for both of us."

There was silence for a moment, then Jabaut said, "Sure. Okay, Larry, all right." He sounded tired.

Tollens' shoulders slumped. Daryl was hurt now, but there was nothing to be done. He put his hands against the chill plastic window and let his weight fall against it. "Daryl," he said.

"Yeah, Larry?"

Tollens crossed the room and paused by the thin sliding door that led to the central corridor. "I'm going to take a walk, maybe go up to the bubble deck."

"Sure." Jabaut stood. "Look, sorry I brought it up. We won't talk about it, not if you don't want to."

"That's not why I'm leaving. I just want to take a walk."

"Sure." His tone told Tollens that he did not believe.

Tollens shoved his hands into the pockets of his coveralls. He stared at his slippered feet as they whispered across the coarse, cold floor of the corridor. He felt as if the weight of the entire planet was bearing down on the roof of the tunnel, ready to crush him. He fisted his hands, and felt the material of his pants stretch across the backs of his thighs. He felt very deep in the Earth, very trapped. Tollens was one of two hundred men on this world which he had been told was vital to the war effort. He was a Forcer, a member of the most elite military in the history of warfare. Only a few thousand men had left the solar system completely behind them, and he was one of them.

But he could not think of his accomplishments in those terms. They were ashes in his mouth. When he had begun the process that had brought him this far, he had expected to be defeated at every step. He had not expected to be accepted into the Academy—and then had achieved a record score on the entrance exam. In class, he had been overwhelmed by his own ignorance—and then finished third in a class of three hundred. Training resulted in the expulsion of thirty percent of all cadets from the Force, and the deaths of one in ten—but he had not only survived, but completed his training on an accelerated schedule. He had applied for duty on Morgan's World—and that request had been approved. He was here—and now would be allowed to

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go no farther? Insanity!

But it was true.

Five hundred meters of corridors linked all the buildings which made up the outpost, as a defense against the heavy planet's winds. It took Tollens only a few minutes to walk from his room to one of the larger, multi-levelled domes which formed the nucleus of the outpost. He descended a short flight of stairs that led into a storage area in the basement of a dome, and then trudged up a set of spiral stairs, through officer country, and up into the bubble room.

The transparent blister at the apex of the dome was not constructed of the same plastic that formed the windows of his own room, but of the transparent, metallic substance that also formed the equally unnecessary observation ports of starcraft. The observation dome was six meters in diameter and furnished with a plush organic carpet that swallowed Tollens' feet until only the tops of his slippers were visible. He kicked them off, and let the warm, dry tendrils of the carpet undulate against the soles of his feet.

The view here was little better than it had been from his own room. He was two storeys above the surface. Immediately beyond the window he could see the limb of the dome curving away from him into the storm and, to one side, the wall of the adjacent dome. Every few minutes, when the wind momentarily died, he could see the living quarters, the garage (an even larger, flattened dome), or the communications mast looming suddenly from the clouds of dust, until the wind rose and obscured them again.

It was a season of transition, the meteorologists said, the blustery demarkation between the growing season and aphelion-winter. Morgan's World's eccentric orbit drew it farther and farther from Epsilon Eridani, and the temperature dropped. Even at the peak of the warmer growing season, temperature outside would have been such that Tollens, unprotected, would have died of exposure within an hour—assuming he could have survived in the thick, oxygen-depleted atmosphere beyond the first few minutes. Now, with the coming of winter, he would have been quick-frozen, as if packed in dry ice.

Some men thrived here. Daryl was one. He saw the environment as a challenge, something to relieve the monotony that a more comfortable existence would afford.

"Tollens," said a voice from behind him. "What a coincidence to run into you." Tollens turned, surprised. Pratt said, "I wanted to speak to you about your request."

Elzy Pratt was the commander of the outpost. Naked except for a belted cloth wrapped around his waist and loins, he walked up the stairs to the bubble and sat down, lotus-position, on the carpet. Pratt was nearly sixty, but except for his gray hair he might have been only about Jabaut's age. His muscles were wiry but in tone, and his stomach was still firm. He was a

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career man, of course. Virtually everyone who did not leave the Force after his first tour of duty was. As Jabaut had said more than once, for all its disappointments and frustrations, if the life agreed with you, it did so for life.

"Sit down, Tollens," said Pratt. "We're not being formal here, I would say." Pratt gave a short and very insincere laugh.

Tollens sat down, his legs crossed in front of him.

"I understand that you intend to surrender your commission when your term of duty is over," said Pratt.

"I haven't made any formal request," said Tollens, off guard. He did not know how Pratt could have known of his decision.

"Oh, I know that," Pratt said. "I would have seen it on my desk. But that is your intention?"

Tollens paused. "Yes, sir."

"I won't ask why, because it's none of my business. In fact, there are regulations which make it none of my business. I would like to know, however, if it is a direct result of my refusal to grant permission for you to carry out your—project? Explorations? What might the term be?"

"It's definite then, sir? Your refusal?"

"Yes. But you haven't answered my question."

"I had thought from the beginning that I would serve only one tour of duty, Commander," said Tollens cautiously.

Pratt nodded curtly, and then he said, "Good, that simplifies matters."

"Sir?"

"If you would resign your commission merely because I had refused your request—which surely must have been expected—then you have no loyalty to either the Force or to my command, and I would have shipped you out of here at the earliest opportunity. I would not have been overly concerned with what your destination turned out to be, either. We can't have men stationed in a war zone behaving like spoiled children."

"I can understand that, sir."

"And had I transferred you off-planet, that would have proved embarrassing for me. As it turns out, Luna has approved your request, and I would have had to explain to Luna why you were unable to carry out your studies—their orders. So it appears things have worked out moderately well all around."

For the moment in which Tollens sorted through all the rhetoric, his face was blank.

"Tollens," Pratt told him, "you have just received good news."

"Yes, sir," said Tollens. "Thank you, sir." He felt as if a great weight had been lifted from his chest.

"Lieutenant Keville will see that the necessary clearances and permissions are drawn up for you," said Pratt. "You will be able to leave as soon as this storm dies down enough to allow surface-to-surface communications to resume. Our satellites tell me that will be within forty-eight hours."

"Thank you, sir. I had better go

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and see about rearranging my work schedule to give me enough time off for this." He started to rise.

Pratt waved that aside. "Don't worry about it. Sit down for a moment, I want to tell you something. I hope you realize, Tollens, that I did not refuse your request out of any ill will towards you, and that Luna did not contradict me because they felt kindly disposed towards you. We have different priorities, which led to our respective decisions. I am responsible for the lives of one hundred ninety-eight men and several millions of credits of material. In addition to that, I am somehow supposed to discover what resources this planet has to offer us with a science department which numbers four men. I must also construct a permanent base here... but now the fact that we have no native labor has absolved me from that one responsibility.

"Luna, however, is responsible for the security of this system, and that demands that our base be completed on schedule. That is why they granted your request. The way the order reads from HQ, you are to investigate the reason for the disappearance of our labor-force, which will necessitate explorations by two or more individuals. That is the only *official* mission you have, and HQ expects it will be completed. If it is not, there will be consequences. You understand this?"

"I think so, sir."

"You know what happened to the last man that tried this."

Tollens nodded. "I know. He was my uncle." He held Pratt's gaze.

"I am aware of that. I am also aware that that is the real reason for your 'studies.' I don't approve of personal vendettas, Tollens."

"I don't—"

"But I understand them. Good luck."

IV

It was clear the next morning. Tollens rolled over onto his stomach and squinted out the window. He was facing northeast, and the dawn light made his eyes ache until he sat up and rubbed them. It wasn't very bright, but it hurt just the same: he had had a few celebratory drinks last night. He looked to the other side of the sleeping pad, and saw Daryl was not there.

"Daryl?"

No answer. Tollens got up and padded across the cool plastic floor to the other side of the room. His work schedule and Jabaut's were taped to the wall. Just as he had thought, Daryl wasn't working today. Then where was he? Daryl usually slept until noon on his off-days. Tollens scratched himself, vaguely suspicious that something was wrong.

He showered, dressed, then went through his lockers for the gear he thought he would need. Enthusiasm was supplanted by determination as he selected his equipment, each piece on the basis of how much it would help him stay alive, outside. Near the door he made a pile of sand-shoes, sonicker pistol, carbine and cartridges, pack, food concentrates, emergency tent, flares, communica-

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tion pack, binoculars, and five different gauges for measuring atmospheric pressure, magnetic flux, and other variables. Then he started to eliminate items. The weapons went first. The only animal in the area large enough to pose a threat was one of the sophonts, and there had never been a case of altercation between humans and natives since the first expedition. Besides, there would be a rifle in his car. He left the flares, and stripped down the communications equipment until he was left with a short-range transceiver. He knew he would have to leave the car before he got very far into the hills, but its own comm equipment would serve as a relay between his transceiver and the outpost. When he reduced the amount of food concentrates by half, he was left with a manageable load of ten kilograms, not including the weight of his out-suit.

Through the window, he could see a dirty smear on the horizon which was the tail end of a retreating dust storm. He punched buttons on the datalink next to his sleeping pad and was informed by a recorded voice that the weather would remain clear indefinitely and that the temperature was a brisk -22° centigrade. Tollens scribbled a note for Jabaut and, gathering his pack, walked to the garage.

The dome was large, but pressure walls broke it up into smaller sections so that its true size was not readily apparent. Most of the available space was taken up by construction equipment, which could not be left in the open for more than a few days at a time without being ruined. Tollens went into the office next to the entrance to the garage. Maps were taped on all the available wall-space, the one desk was loaded with cassettes and paper, and there was seven or eight filled tape-racks, and (Tollens blinked) a wheel-hub. A middle-aged, bald-headed man was sitting at the desk, staring into a datalink screen. Tollens cleared his throat to attract his attention.

The man looked up with a faintly annoyed look on his face.

"I'm here for a ground-car," said Tollens. "I talked to Lieutenant Keville earlier and he said he's taken care of it."

The man thought for a moment. "Your name is—Toland?"

"Tollens," said Tollens.

"Right." He pushed papers around on his desk, produced a long form and a stylus. "Put your mark on this and I can release the car. Bay nineteen. Your partner is waiting for you."

Tollens paused between the signing of his first name and his last. "Partner?" he said.

"Right. He doesn't have to sign, though. Just you."

"Thank you." Tollens asked him for directions to bay nineteen. It was the one nearest the airlock. The car was the standard model: built close to the ground to cut wind resistance, balloon-tired, with a diesel engine and its own oxygen supply. Jabaut was suited up and his equipment was in the cargo box. Tollens looked at him for a

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moment and then threw his pack into the box, too.

"Regulations say at least two men when you go out," said Jabaut. "You know that."

Tollens checked the connections on his suit's heaters.

"Going to get lonely out there for me, no one to talk to," Jabaut said after a minute had elapsed.

"Did Pratt select you?" asked Tollens. "Or did you volunteer?"

"Had to be someone with some off-days coming up," said Jabaut. "Can't throw off the schedule."

"You know there's not going to be any work done anyway."

Jabaut shrugged. "Keville asked me. If I'd turned him down, would have been someone else."

"I know that. And you also know that I didn't want you to go—or you would have mentioned Keville had asked you."

"Hey—we didn't think *anyone* was going, yesterday."

That was true. Tollens didn't say anything.

"I managed a gang of natives. Keville figured that's as much experience as anyone's got with them. And they wanted someone with more time on the Force to go with you. You know about those records they want done up? For Luna?"

"The mission-profile is that we find out where they've gone, and why, and when they're coming back."

Jabaut grinned. "Funny if they're not. Pratt would not be pleased."

"He was against this. Luna is who wouldn't be pleased. If we don't come back with some answers, the time after we get back could be more exciting than the explorations. If we can't complete the base on schedule they'll need someone to blame, and Pratt won't be enough for them. You might be risking your career, Daryl."

"Like I said: if it's not me, it's someone else."

Tollens sighed. "Can I get you bounced out?"

"Maybe," said Jabaut. "But it would take you awhile to do it, and in that time they might decide they didn't want to risk two men after all, and cancel out. Or Pratt could decide maybe you're too caught up in your own head to be trusted with the job. I wouldn't chance that, if I were you."

Tollens swung himself into the driver's seat. "So let's go."

He eased the ground-car up the first airlock door. A mechanic plugged a diagnosticator into a jack in the side of the car and watched figures for a moment before he nodded. "Everything checks."

Tollens nodded.

The garage door rolled up. Despite all the precautions, a little sand drifted in onto the stained concrete floor of the garge from outside. Tollens eased the car forward, past the first door, then past the inner door of the lock, which closed behind them with a sighing sound. The pressure in the airlock rose, the outer door opened, and Tollens drove up a short steep incline and onto the surface of Morgan's World. Behind them, the domes

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of the outpost were low, gray blisters which soon shrank with distance, and then disappeared.

"Where are we going, exactly?" Jabaut asked after half an hour. His voice was harsh and breathy through the mask.

"We won't know until we find it."

"Sure."

"Hundred kilometers," Jabaut remarked. "Wish we knew more about what happened to the other guy."

"His name was William Evers," said Tollens. He had used the past tense, but Will was still alive, of course—preserved by medical technology and the perseverence of Tollen's memory.

"When I was younger," said Tollens, "he brought me some photographs of the natives the first expedition had taken—big ones, like posters. I pasted them up on the walls of my bedroom, and I remember the best thing about them: it wasn't that these were actually photos of creatures from another world—but that they looked like my dog. Superficially, of course, and it seems silly to think of it in those terms now. But I felt . . . secure that the Universe seemed to fit in some sort of pattern, that this world had some sort of connection or something in common with what *I* knew. I think I was nine when the dog was killed. But it's funny, I still think of that damned dog every time I look at one of them."

"Name?"

"Baskerville."

Jabaut laughed. "I've read Doyle, too." He caught Tollens' look of surprise. "Oh, can read. Just never learned to talk good. Mean, 'well.'" He laughed again. Then he said, "Can see you carry around the memory of your dog like the memory of your uncle. Like crosses. Christ only carried one; why do you think you can do two?" Tollens started to say something, but Jabaut went on, "You've got to keep going, not be mired like you are. No bringing any of them back. Got to keep going out, and every year and mile dies behind you, and no going back to any of it."

"Is that why you keep going further and further out? There's a limit to how far you can go."

"No limit for *me*. See, when I go back it's changed. I see it different every time around. I get back to homeworld once in three, four years. Different every time. I don't look for what was, like you. I look for what's new, what *is*. Every time I open my eyes in the morning there's something new." He pointed. "That's one of the villages ahead, right? We going there, Theta?"

"For a start."

"Make it for a finish."

Tollens drove the car up to the village, then braked and turned off the motor. He said to Jabaut, "I don't know just what we're going to find—if anything—so we'll just have to keep our eyes open."

"Don't know how much help I'm going to be, Larry. Only been out to

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the villages two or three times before, never for very long."

About five hundred individuals had lived here. Tollens made the ritual of entry as he walked into the village.

"Larry?"

Tollens turned. Jabaut hesitated, as if there was a tangible barrier before him, and then he crossed into the village. "What was all that stuff about?" he asked.

Tollens did not know what he was talking about for a moment. Then he said, "The entry ritual...reflex, I guess. You get used to doing it."

"I guess so," said Jabaut doubtfully. "I never bothered with that stuff."

"Ritual is very important to them," said Tollens. They walked deeper into the village. Each hut looked like a tired animal lying on the sands. Tollens found himself walking quietly, as if he might wake them.

"Place is kind of eerie when it's deserted." said Jabaut. "Always crowded when I came here. Lot of little ones around, kind of cute. They left too?"

"Everyone," said Tollens. "What time is it?"

"2.54. You expecting someone?"

Tollens stared around the village. "Two or three minutes to local noon. He should be here any minute."

Jabaut touched him on the arm. "What're you talking about?"

"Here he comes." Tollens pointed. Through the ear pieces of his mask he could hear a low, moaning sound which was not the wind.

The dancer appeared, and trotted to within a few meters of them.

"What's happening here, Larry?" said Jabaut. "Thought they were all gone."

"His name is Dancer," Tollens explained. "He's been waiting for me. He's been here every day for the last three days, but today's the last day he was going to wait."

"He's going to show us where they've all gone?" said Jabaut.

"Not us," said Tollens. "Me. You've been playing Pancho to my Don Quixote, but this is where it has to stop."

"What? Larry, listen to—"

"No. I've been waiting here for six months. You've been here since the outpost was set up, so you don't think that's long time—but it is for me. I spent my off-hours with the Morganans, trying to understand. I could feel it happening, Daryl: I *knew* they were going to move. It was the same thing when it happened to William, and I felt it coming closer."

"You knew? Should've told Pratt, then. Maybe he could have done something."

"You don't understand. Neither does he, or maybe I could have explained it to him. But it wouldn't have made any difference anyway, because nothing could have stopped them from leaving—it would have been like trying to make the wind stop blowing. These people haven't changed in ten thousand years. This—thing, they do, it's important to them, and that's all I know for sure about it. Maybe they had a migrational instinct once and it

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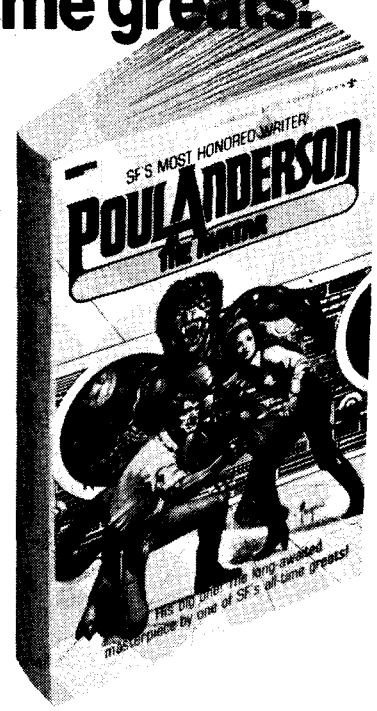

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survives in this ritual. I'm going to find out, and find out what happened to Will when he tried to learn what was going on."

"Why isn't that one with the others?" asked Jabaut, nodding to the dancer.

"Ask him yourself. He knows Ameslan."

Jabaut paused, then blurted, "I—why're you here? What do you want?" He looked at the native, who did not move, and then at Tollens.

"Ameslan," said Tollens.

"Forgot. Damn." Jabaut repeated his message in sign language.

The dancer's body twitched. His long, thick fingers made the signs that meant, *Tollens' wish.*

Why aren't you with your people? Jabaut signed. He turned to Tollens. "Something wrong here, Larry. Something's not right. They all leave, strange, right, yes—but why not him? You've...talked to him a lot?"

Tollens nodded.

"Trust him?"

Tollens thought for a moment. "Trust? No. I don't know how much he understands of what I say. I don't know if I really understand what he says—so I certainly can't know what he thinks, or what his intentions are. But I've *got* to do this, Daryl."

Jabaut signed to the native, *Why are you here, and no others? Where are you going?*

Only Tollens, was the reply.

Jabaut looked at Tollens, eyes pleading. "Larry, what the hell's happening?"

"He said he'd show me, Daryl, and no one else. I don't know why me, and not someone else. Maybe they think I'm the only one that's shown an interest. None of the other natives would discuss it at all. The dancer can't or won't explain either beyond a certain point. For that reason I think he's an outcast...or maybe privileged. Finally, he offered to show me this thing of theirs. He couldn't tell me much about it, but maybe that's because I'm too stupid or different to understand."

"Larry," said Jabaut, "don't go. End up the same way as your uncle, I know it. Not worth it, just to find out what happened."

Tollens shook his head. "I *know* what must have happened. Daryl. There was nothing physically wrong with him when he came back. He hadn't been drugged or poisoned. The only thing that could have driven him over the brink was exposure to subsonics—like the natives emit. He was warned about that before he went up, though; everyone was. What I have to find out is why he went in the first place, and why he stayed long enough to get...hurt. I have to know what it is that forced him to stay, or made it worthwhile for him to stay. I think I've got an edge over Will, though, I've seen what can happen for myself."

"What if it doesn't matter? What if that's no edge at all? But it's no good talking, right? Just like always. Sure. What do you want me to do?"

"Will was gone fifty hours, accord-

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ing to the logs of the second expedition. I figure at least half that was when he was wandering around, before someone found him. I think this thing of theirs lasts about a day."

"Whatever it is."

"Whatever it is. I don't want anybody else to come, and I don't think the dancer would allow it. But we have only one car and there's two of us."

"Take the car."

"What will you do?"

"Leave me enough supplies for...five days. Food and water, extra batteries. I'll wait for you here for two days, then start back to the outpost. It's a hundred-ten klicks. Make it back inside transceiver range with a day to spare, maybe two. Hard to tell what reception will be like, with weather and all."

"That's five days in a suit."

"Uncomfortable," acknowledged Jabaut. "So? You know how far you have to go?"

"Not exactly."

"And you can't keep up with a Morganan if he wants to hurry. Take the car."

"All right." Tollens motioned to the dancer, and started walking to the ground-car. "Thanks. I won't forget this."

Jabaut only said. "Be sure you come back. Do that."

"I will."

"I'm going to walk around here for awhile." said Jabaut. "I don't see you leave, right? Don't forget about my supplies."

Tollens and the dancer performed the ritual of exit and walked to the car. When Tollens had set Jabaut's supplies in a pile on the sand and transferred his own to the front seat, he coaxed the dancer into the cargo box. It was roomy enough, but he could sense the native was uneasy. He signed his discomfort, and Tollens reassured him. Then the native formed the symbol for *Who?* with his hands.

"Jabaut," Tollens said out loud, and signed, *A good friend.*

Love, the native signed.

Tollens stepped down on the accelerator and the car threw dust into the air as it sped away from the village.

The dancer directed him, and he headed further north and west, into a highland area one hundred-forty kilometers from the outpost. This was desolation. He had never before been without some sign of the terrestrial civilization which had made some slight inroads on the planet. Here, alone, it was too easy to believe that he was the only human being in the Universe...and Tollens fought down that thought, recognizing it for an enemy. He could not have his thinking clouded now. Something about this time and this place had driven his uncle into insanity, and whatever it was, Tollens could not let that force affect him. He must get close enough to it to observe and define it—and if that got Luna the answers they wanted, well, that was all right, too. That was the reason they had let him go, but it was not the reason he had left. The

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memory of his uncle haunted him. He must bury it.

They left the car in the foothills and started higher into the rocks. The dancer's gait was a shuffle, for Tollens' benefit, but the human still had to walk briskly to keep up with him. They walked for forty minutes, and Tollens had to stop twice to rest. Once he looked down into the valley from which they had come. He could still see a patch of brightness down below which was the car. They hadn't come very far. The dancer waited silently and patiently for him until Tollens, vaguely ashamed at his weakness, rose and followed after him before he was fully rested.

As they neared their goal, Tollens felt an icy fear growing in his stomach. He buried it under an armor fabricated of an even colder determination.

Up in the hills, among the rocks, Tollens saw inscribed in a block of stone a symbol, a six-pointed star. He saw the dancer make ritual signs before it, and then they passed it and came into a valley, and in the valley were Morganans.

V

Some god had pushed his finger into the earth to the first joint. Then a stream had run down the west side of the resultant depression, dug its way through the east slope, and dried up. The bowl of the valley was about seven hundred meters in diameter. The valley was teeming with natives, and in his mind Tollens laid down a grid with sections ten meters on a side, and counted the individuals in a section. He calculated: there were at least a hundred thousand natives here. .

That must be the population for a three or four hundred kilometer radius around the outpost.

Tollens had had no idea....

The dancer led him forward. The Morganans were milling around, but they made way for the human. At the periphery of the mob, stores of fruit, wild grain, and recently-slain carcasses had been made; there were tons of food, enough to feed all these individuals for the duration of the event, and on the journeys back to their respective villages. All tools and weapons had been left on the perimeter, too. Tollens saw piles of stone knives, short bows, and spears in a seemingly hopeless jumble. One of the Morganans reached out slowly to Tollens and tried to remove his respirator from his face. Tollens backed away, and stumbled against another native. More hands reached out for him, and he tried to bat them away. He felt as if he was drowning in a sea of alien flesh, until the dancer intervened. His mouth opened to shout, and Tollens felt a pulse of subsonic vibrations reverberate in his guts as the dancer ordered them back. They fell away, and Tollens, breathing heavily, rested a moment before continuing downslope after the dancer.

It was late afternoon. The shadows on one side of the valley were lengthening. On the east slope, the setting sun bathed the natives in molten gold, making them seem like animate statues. On the west slope, shadows

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made them carven stone.

Was this a nation? Tollens wondered. Tribe?

Family?

Humanity had known of these creatures for a decade and a half. The first expedition had remained for ten months, the second for three. The outpost had been in existence for a little over a year. The number of man-hours spent on the planet was small. Its physical features had been plotted, atmospheric composition determined to a dozen significant figures, and orbit, mass, and gravitation pull all were known. Photographic maps of the globe had been fabricated, but they only delineated the boundaries of ignorance. Did Goldberg and his associates even know there were a hundred thousand sentients on the planet?

Tollens was not sure.

He did not know precisely where he was. He had no idea what was to happen. Or maybe this gathering was all that was going to happen: a gathering, an exchange of salutations (or news? challenges? threats? poetry?) and then a dispersal.

Was this a clan meeting? A celebration?

A religious service?

Tollens did not know.

He felt a growing fear clawing at him like a ravaging animal. Everything was too large for him, and he felt like screaming. There was a beast in this valley which he could not see, and he felt it crouched and waiting behind him.

Wait, the dancer signed to him. *You will see me dance.* Tollens and his guide stopped at the edge of a twenty-meter circle in the center of the valley. The dozen natives stood around the open area, an equal distance apart. Before each was an earthenware pot which were the first artifacts Tollens had seen inside the perimeter. Alternately, the pots were filled with either a brightly colored metallic powder, or they held a stick coated with some sort of resin. The dancer moved to the center of the circle. It was only now that Tollens began to suspect that the dancer had named himself very literally. All around Tollens, the natives were settling back onto their haunches. He sat on the ground with his legs crossed in front of him. He was in the front row, with an unobstructed view, and the performance was about to begin.

Any confidence he had managed to bring with him this far ran out of him like water through a sieve. He fumbled for the transceiver clipped to his belt. If Tollens could reach him, Jabaut could follow its signal back to him. At worst, the outpost could be called and they could send an aircraft or another car to pick them up. Tollens did not want to remain here now at any cost. If necessary he would leave on his own, and try to walk back to the car...even though he did not feel as if he could walk a dozen meters without blacking out, so intense were the emotions roiling within him.

His transceiver was gone.

One of the natives must have taken it, when they had manhandled him.

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Tollens began to tremble.

In the center of the clearing, the dancer now stood motionless. The audience was still. The tableau lasted for *minutes.*

Tollens looked over his shoulder several times, feeling more foolish each time because there was nothing there and nothing had changed. He was the only thing moving on this nightmare landscape. The natives might shift slightly, their ears twitch, or their mouths work, but for the most part they were still. Tollens fidgeted, his chest constricted with hot bands of tension that gripped him until he felt he could not breathe. He held his hands in his lap and locked his fingers together; he heard the bones creak, the joints snap. He tried to think: of how to get away, of what to do, but his thoughts slipped from his grasp, eluding him like dust. And then he stopped thinking altogether for the dance had begun.

The dancer gazelled around the cleared area three times, then returned to the center, pirouetted—*moved.* Tollens stopped noting details. Later he would be able to recount them precisely, but now he saw the dance as a whole, not as a collection of steps and maneuvers.

It was utter magnificence, and he was a part of it. He no longer had any desire to leave. It would have been impossible to leave.

The dancer was everywhere at once, moving, always moving (like: a rippling snake, like water, a bird, clouds, power, a good woman, a ship under drive, electricity). He leapt straight up, until it seemed he would never come down, and then was down, rolling and jumping and wheeling and *jumping again like some alien dervish.*

The dancer stalked and turned around the edge of the circle now. The natives stationed on the perimeter tossed double handfuls of the dull silver powder into the air. In moments, the dancer's fur was coated. Now a metal figure, the dancer returned to the center of the circle and when he jumped, motes scintillated in his wake.

Tollens sat enraptured, and made no note of the passage of time. He saw. He was. He felt the chants of the natives rumbling through the ground and into his suit and his soul and somehow, somehow, he understood the meaning of what he saw.

Winter was coming. As a species they had seen the approach of a million such seasons. They understood that when the sun grew smaller, game became scarce and the plants they relied on for sustenance slept, and would no longer feed them. It was a time of death. Each winter, their population was thinned. This they understood from the moment of their birth.

The dancer bounded to the center of the arena and then leapt straight up, three meters, seven, until it seemed he was suspended, motionless, by an invisible wire. Then that wire was cut and he was on the ground without seeming to have fallen, as if he had simply appeared

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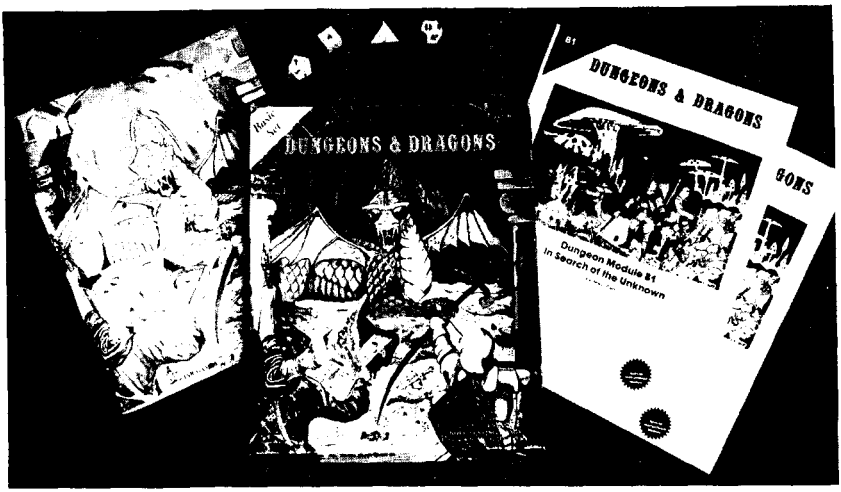

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there. Silent and alone the dancer was, motionless.

They did not dispute winter's dominion over them. It was wholly for them to do so. They did not know joy at winter's coming, but they accepted it as totally as they did the beating of their hearts—as a condition which should not and could not be changed. Through their dances they did more than express confidence in the order of the Universe, in the renewal after the death in winter. Like early Man, the Morganans believed their rituals influenced that order. Perhaps it was so. Both order and ritual had existed together for a thousand thousand years.

At the edge of the circle, a dozen sparks were struck, a dozen bowls of pitch sputtered to life in the heavy evening air. The Morganans drew their brands from the pitch. They traced intricate patterns in the air with their fire.

The dancer had not yet stirred, though he seemed unhurt. Tollens regarded him, wanting to do nothing else. He was at peace. The cold could not harm him, not when he was a part of the order. The dance had made him one with the dancer, his people, the planet, the Universe.

His mind moved in lazy circles around the concept of the dance. Isolated thoughts coursed through Tollens' mind like brightly-colored fish darting deep under the surface of a stagnant pool. This was the small part of him which struggled against the quiescence that held him, and which was losing that battle. *This happened to Will,* he thought. *This is what happened to him.* (Thought-patterns alien to him struggled to suppress this neural insurrection.)

And that other, larger part said, *Isn't it so very wonderful, this quietude and peace which you have never known before?*

The torches were thrust aloft, waved once, and then thrown onto the dusted flesh in the center of the circle.

Particulate magnesium ignited, flared, struck at Tollens' eyes with claws of actinic light. He threw his hands in front of his face, but what he had seen was already burned into his retinas, and swam before his eyes like a baneful mirage. The dancer's fur and the outer layers of his flesh burst into a white fireball. The writhing figure was silhouetted by its own ignition. The dancer screamed, and Tollens felt the sudden pulse of subsonic vibrations. The pitch of the dancer's voice rose until it entered the audible range, and Tollens *heard the scream.*

(That inhuman and mercifully short scream....)

Tollens clutched his head and his hands met only the slick plastic of his mask. He clawed at it frantically to try to somehow block out the sound that had died even as he moved against it, even as the dancer died.

But the ceremony was not over. The circle of natives drew tighter around the smoldering corpse until Tollens could barely see the stone blade one of them held rise and fall, rise and fall,

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scattering droplets of blood and gobbets of carbonized flesh into the air. Tollens did not know quite what had happened until, a few minutes later, the circle fell back. The native who had wielded the knife now held a Morganan infant three times the size of a human newborn; it was still wet from the birth. The other natives passed before the infant, made gestures over it, and then it was set on the ground. It wobbled for a moment, unsure of its footing, and then it looked around with huge, dark eyes.

The world is always renewed in fire.

It had never occurred to Tollens that the dancer might have been a female.

He looked around him as if he had never seen this place before. The valley was empty, except for himself and the performers, and now they were leaving. He wept, because the dancer had died and something else had also been slain, and then he stood and turned and he started the long walk back to the car, Jabaut, the outpost.

One flat snowflake drifted down from an iron sky. And then another.

It was snowing. That was all.

VI

The ground-car bounced across the last dune and Tollens could see the dark splotch of the garage looming out of the darkness. A single bit of fire burned at the top of the communications mast: the sun, still below the horizon, shining on it. It would be dawn soon.

Jabaut had not said anything to him on the ride back from the village. It wasn't time.

Someone at the outpost had seen the car coming. Tollens had not radioed ahead, because disabling the car's transceiver had been part of Jabaut's cover story. The airlock door was open when they reached it. They passed through, and came into the arc-light inside the garage, and into a crowd of about a dozen men.

"A couple of us were starting to get worried—"

"—didn't call in—"

"—did it go?"

Tollens pushed through them, staring straight ahead, and Jabaut bulked large in his wake and fielded the questions. He kept them away from Tollens, kept them satisfied for just a little while longer. He lost Tollens for a minute, then found him again in one of the equipment bays, stripping off his dust-impregnated out-suit.

"You see it, don't you?" said Jabaut with such tangible sadness and weariness in his voice that Tollens could not answer for a moment.

And then Tollens said, "What are you *talking* about? You weren't even *there*—"

Jabaut shook his head. "Makes no difference. Guess you'll tell me what happened sooner or later, but I know what happened to you. You just ran out of a reason to do things. You're running, but there's no road now. See what I mean? You have to make some decisions for yourself now, not live with decisions you made when you were eight, for sake of Christ. I think

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you could stay here, work, though it might be hard. I think you could do it. Or something. Really do."

"Oh damn you, damn you...." Crying.

"I'll call Pratt," said Jabaut. "Tell him we'll be up in half an hour, right? Time enough for you to get together."

Tollens swallowed more tea, and held the cup in front of him like a shield. He felt very vulnerable. "Most of the natives are back in their villages already, you'll find, or they will be within a day or two. In the future, we'll just have to work our schedules around this one time of year when they simply will not—*can* not—work."

Pratt nodded, and then after a moment he said, "And your uncle?"

The question hung in the air for a long time, until Tollens said, "He attended one of these rituals, too. I'd been pretty sure of that before I left. We know in extreme cases the subsonics emitted by the natives can cause massive neurological problems—like psychoses. The earpieces of our respirators would normally filter it down to safe levels. But there were a *hundred thousand* natives, all of them chanting, or whatever it is they do. I was out there, with them, for five hours. Like Will, I was so hypnotized by the dance that I not only lost track of time, but I gave no thought to leaving." Tollens shook his head. "In many ways the Morganans are much closer to their animal, primeval ancestors than we are. Unlike us, they have no conception of being beyond or outside the Universe. They are one with it, and that comes across so powerfully in this ritual of theirs that even I, an alien, could understand it."

"Then the dancer screamed..."

"Yes. That broke me out of the trance. By that time the natives were leaving, and the subsonics with them. If the dancer hadn't broken me out of it, I might have done it myself—eventually. Will never did. He came out with the attitudes and values of an animal, in conflict with his society and his base psychology. He couldn't adjust. He tried to reconcile the differences by killing himself."

"I'm sorry," said Pratt automatically, politely. Meaninglessly. "It's good that Jabaut wasn't with you. That would have been pushing our luck a little far."

Daryl had been busy on the ride back to the outpost. He had damaged his suit's heater system after Tollens had gone back to Theta to pick him up. He had told everyone that this was why it had been necessary for him to stay behind, with the car and its heater, while Tollens went into the hills. Disabling the car's transceiver explained why they had not called for assistance. It was a tissue of lies, but no one had questioned them closely enough to tear it.

"I have your discharge here," said Pratt. "I understand why you'd want to leave. The natives have nothing more to give you, and I doubt the Force ever did, Tollens."

"Sir? I don't know what you—"

"When you came to this outpost, I

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didn't know how you'd work out. Men like you, rising so quickly, usually have trouble adjusting to the routine of a duty station, where it is almost impossible to distinguish oneself for individual achievement. But you were a good worker, and working with Captain Goldberg you managed to do a little more than your share. Frankly, I'd hoped you would stay and work more with the natives. This whole episode illustrates just how little we know about them."

"The Force has never placed any importance on our relations with the natives," said Tollens a little hotly. "Their attitude mystifies me: our ignorance is a danger to us."

"I agree," said Pratt. "That surprises you? I have to follow orders, and the dictates of our appropriations, but I don't have to agree with either. I know our presence here is more to convince the people back home there is actually a war going on than for anything else. I was glad to see you—or anyone—working within those limitations and still manage to expand our knowledge of Morgan's World. Now we know that these natives can feel sympathy for us—as evidenced by the dancer's attitude. For whatever reason, she *wanted* to show you what was going on. But your interest in them stemmed only from the fact they had information you wanted."

"That's not entirely true, sir." Pratt just looked at him. Tollens said, "I'd wanted to speak to you about my discharge."

"Daryl," he said, sliding the door shut behind him. "I'm back."

"Sure. Knew you would be. Looks nice outside, huh?" The snow was still falling outside, burying everything in a cloak of white.

"I'm waiting for the spring," said Tollens. ■

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the spaceport

PART I: AN ALTERNATE MEANS OF DELIVERING PAYLOAD TO ORBIT

Must space travel be astronomically expensive? *Rockets* are—but here's a new concept that may change our whole view of such things.

by ROGER ARNOLD and DONALD KINGSBURY

THE FABLE

Everyone knows the fairy tale of the gnome who fell into the burgomaster's well during the summer of 1212 AD and how he got out. Actually he didn't fall in—he was thrown in by the outraged burgomaster. Our gnome, who cobbled shoes for a living, was caressing a lady's foot and the lady happened to be the wife of the burgomaster.

He could see the stars from the bottom of the well. It was cold down there and our gnome wanted to get out. Sometimes the burgomaster's mean servant lowered the well's bucket on its pulley and made him raise countless gallons of water in exchange for a few crusts of bread. Altogether it was a pretty horrible life.

When the servant wasn't around, which was most of the time, he tried to escape. The walls were so slimy he could only climb a few stone levels that way. Once he tried hand-over-hand ascent up his half of the rope but his arms weren't strong enough and the rope was too slippery. He dreamed of sitting in the bucket and pulling himself up but he never had the bucket without the mean servant. His only chance was to make a single leap of twenty meters.

That was going to take energy. Being a meticulous gnome he calculated exactly how much. When the burgomaster had tossed him down the well his velocity of impact had been 20 meters per second as determined from the redness of his belly at splashdown. He massed only five kilograms. Energy is mass times velocity squared

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divided by two and so he needed 1000 joules of energy to extract himself from his predicament.

He moaned. The most he could put into a really strenuous leap was 50 joules. His lamentations attracted an Irish elf who was taking a day off from bombing pubs in Belfast.

"And how be you?" grinned the elf from the top of the well.

"Exceedingly sorry."

"Now and if it doesn't look as if you'll never get out."

"I will so."

"I'd be betting that you haven't got a thousand joules to your name."

"A thousand joules isn't so much," said the gnome petulantly.

"And the moat around the Lord's castle isn't much to a whale."

The gnome became irrationally defiant. "I don't need a thousand joules!"

"Roofs don't need walls," agreed the elf with a twinkle in his eye.

"Help me," pleaded the gnome miserably, thinking to ask the elf to lower the bucket.

"F*aa*ther in Heaven, I do believe you're sounding like an English gnome. So it's to be *my* thousand joules, is it?"

Suddenly the gnome grew cunning. "I can escape with one joule," he said to whet the elf's curiosity.

"You can't be saying what I'm hearing you saying!"

"But I am."

"Heinlein said, 'There Ain't No Such Thing As A Free Lunch!'" reproved the elf, "and if I didn't know you to be an educated gnome I'd remind you of the conservation of energy."

"One joule," insisted the gnome. Hiding his smile, he added, "I'll show you."

"That I'll be seeing on a sober Saturday night!"

"It will be quick, so you'll have to watch closely."

The elf stood on tip toes, peering over the well wall.

"You'll get a better view from the bucket."

Derisively the elf set the bucket on the wall and perched himself in it. He spat out some apple seeds, ready to wait a few moments while this braggart's bluff was called. The gnome gave a tug at the well rope just strong enough to tumble bucket and elf-cargo over the edge. Down went the fat elf. Up went the skinny gnome hanging onto the rope for dear life.

A FAST OVERVIEW

We stand at the bottom of our gravity well, gazing upwards. We yearn for the stars but right now we would settle for the planets. No one can call us idle dreamers. We have done our homework, and we know what it takes to escape from our well.

A kilogram of mass in orbit around the Earth at a height of 275 kilometers contains some 33 million joules more energy than it does at rest on the surface of the Earth. And, if that kilogram is put there by oxygen/hydrogen/kerosene rockets, another 40 to 60 million joules must be invested in the exhaust

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gases. That's a staggering energy input, but not enough to stop us. We have built powerful juggernaughts like the Saturn booster to get three men into space for a few days of freedom. We have reached Mars with our unmanned probes and travelled out beyond Jupiter. The sky above us is laced with communication and surveillance satellites.

All this we have been able to do by becoming masters of Brute Force. Soon we will have the Space Shuttle where Brute Force will be tamed into a reuseable package. Yet Brute Force will always remain expensive. It hasn't yet dawned on us that we can reach space for a modest "tug on the rope."

The philosophy of Brute Force is simple minded. It assumes that the energy in the exhaust gases is an unavoidable expense and is not recoverable. It assumes that when we return, the orbital energy of a vehicle can only be dissipated and used to heat the atmosphere. It states as a law that 70 to 100 million joules will be lost every time we cycle a kilogram from Earth to low orbit and back again.

The argument is reminiscent of engineering thought at the time Newcomen invented the steam engine. Steam displaced air in a chamber and was then condensed by spraying to create a vacuum. Air pressure pushed the engine's piston into the vacuum. No one considered the hot cooling water of this cycle as a useful energy source and it was simply run off with the water that was being pumped out of the mine. This practice continued until the mines got so deep that the pumps were consuming the entire output of coal. The Newcomen engine was about two percent efficient. Later engineers learned how to recycle waste heat, and how to use higher pressures and temperatures.

We find ourselves asking a fundamental question about spaceflight. Given that a good part of what goes up will eventually come back down, is it really necessary to waste all the energy contained in the returning mass? Can we somehow devise a scheme that will allow us to use mass dropping into a gravity well to help us lift other mass out? The answer is yes, we can. In fact, there is more than one way.

SOME NEWTONIAN THOUGHTS

We begin our analysis with a small observation whose significance is easily overlooked. While it is very difficult for a rocket to reach true orbit—particularly if it is a single stage rocket—it is easy to reach orbital *altitude*. Modest pre-Sputnik rockets reached heights well above the atmosphere. Merely getting up there is much easier than getting up there with a residual horizontal velocity of nearly eight kilometers per second—how much easier being a function of distance above the Earth's surface.

We must convert motion into *potential energy* to reach vertical altitude. We must generate *kinetic energy* to attain horizontal velocity. And so our story is told compactly by examining the ratio P/E where P is the difference in the potential energy between surface and orbit, and E is the total energy

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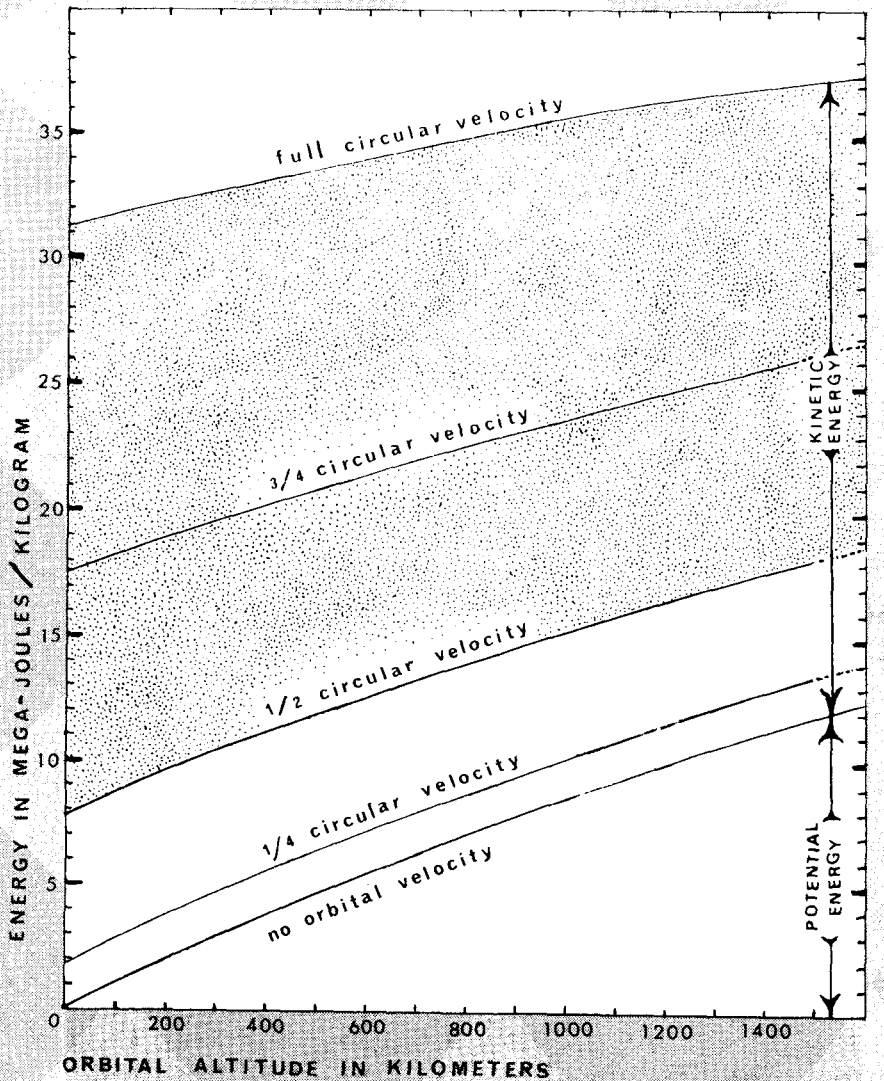

FIGURE 1: Energy Content Of One Kilogram At Various Altitudes And Velocities Above The Earth. Pick an altitude. The vertical distance to each curve represents the energy invested at that altitude in one kilogram moving at the given fraction of orbital circular velocity. The shaded area indicates the portion of the energy supplied by a spaceport receiving payloads at half orbital velocity.

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change between sitting on the surface and moving in a circular orbit. This ratio boils down to $P/E = 2h/(2h + r)$ where h is the height of the orbit above the Earth and r is the Earth's radius, 6378 kms.

When h is 275 kms (a 90 minute orbit) this ratio is about 1/12 and tells us that very little of our insertion energy is needed to reach that orbit, most of it being used to attain orbital velocity. On the other hand if we aim for a higher orbit, say $h = r$, the ratio becomes 2/3. Most of our energy must now be used to overcome gravity, only 1/3 of it being used to attain orbital velocity.

Why the fuss? If we don't have orbital velocity by the time we reach orbital altitude we will just fall back down again. This conclusion seems obvious but it is a fallacy. We *can* stay up there and that is the key to a whole new way of viewing spaceflight.

Imagine that at its apogee our vehicle, which we will refer to as a "lighter," suffers an inelastic and non-destructive collision with a relatively massive spaceport already in orbit. The laws of momentum conservation tell us that the vehicle will be accelerated and the spaceport decelerated. The spaceport, with the vehicle attached, will drop to a slightly lower orbit. The vehicle has acquired its orbital energy, not via additional rocket power, but at the expense of the spaceport. Our spaceport is acting as a momentum bank and has just given our vehicle a loan.

If we continue landing vehicles without doing anything to repay these momentum loans, the same thing will happen that always happens in such cases: things will come crashing down around our heads. To remain solvent, then, we must soundly finance our borrowings.

The obvious method is to use part of the payload of such a lighter as reaction mass for high impulse rockets mounted on the spaceport. If the exhaust velocity is high enough—as it can be for an ion engine—the fraction of payload mass required can be quite small. Unfortunately our momentum debt is proportional to mass times velocity, while the energy needed to generate this momentum is proportional to mass times the *square* of the velocity. The higher the exhaust velocity of the spaceport mounted engines, the more energy it takes to pay off the momentum debt. And energy costs money.

Ideally we would like to repay our debt by ejecting reaction mass from the spaceport at a *low* velocity. Where is such a large amount of mass to be obtained? If we assume that our reaction mass has to come from the lighter's payload, we have no choice but to use energy gobbling high impulse engines to keep the spaceport orbiting. But there is no law that says reaction mass has to be a fluid you squirt from a rocket nozzle. Consider the lighter vehicle itself as reaction mass.

We can build a long catapult that shoots the lighter out the rear of the spaceport. We know how to do that. The catapult would be a linear synchronous motor—what G.K. O'Neill has dubbed a "mass driver." To

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achieve the velocities required, it would have to be a long and powerful mass driver, but there is no theoretical reason why it can't be built. The technology is well understood.

Using a mass driver to accelerate returning lighters away from the spaceport allows us to get a maximum of reaction mass without cutting into vehicle payloads. In fact, if the returning lighter is loaded with space manufactured goods, lunar raw materials, etc., of mass equal to its standard payload, then the velocity it needs to kick the spaceport back up to the original orbit is just equal to the velocity it had when it arrived, and the energy needed to effect this return is equal to that which was released while braking on arrival.

Assuming a means to recover and store the braking energy, we have an interesting situation. Aside from covering conversion and storage losses, no net energy input into the system is required. With a steady stream of arriving and returning lighters we can even dispense with most of the energy storage requirement. The arriving lighter and a returning lighter simply exchange velocity and momentum, leaving the arriving lighter in orbit. As a bonus, the returning lighter drops into the atmosphere with only a moderate velocity, continuing the trajectory that the arriving lighter would have followed had it not "landed" at the spaceport.

If there is no cargo for the re-entry leg of the lighter's flight, then the situation is a little different. The mass of the returning lighter is less than that of the arriving lighter so the return velocity required to pay our momentum debt is greater. A net energy input is called for, but not nearly so much as would be asked if the returning lighter couldn't be used as reaction mass. In effect, we only have to pay for the difference between outbound and inbound traffic, which means we only have to pay for what we leave in orbit.

THE SPACEPORT'S LENGTH

How long would the spaceport structure have to be to capture a vehicle nondestructively, that is in a way which can be called "braking" rather than "crashing"? The relevant equation is $s = v^2/2a$ where v is the velocity change, a is the acceleration of the vehicle, and s is the distance through which the change takes place. Suppose our vehicle can tolerate an acceleration of $50 m/sec^2$, about 5 gravities. Its velocity change from standstill to circular orbit at height 275 km is 7740 m/sec and so s must be 600 kilometers. That is a *long* spaceport, about the distance between San Francisco and Los Angeles, or Chicago and Kansas City. It is not impossibly long, but a compromise is in order.

The obvious compromise has our vehicle meeting the spaceport with some horizontal velocity and so we become involved in a trade-off between rocket supplied momentum and spaceport supplied momentum. At one extreme if we want to use a small Piper Cub of a vehicle which has the bare capacity to climb above the atmos-

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phere with no horizontal velocity we will have to build an enormously long and complicated spaceport. At the other extreme, if we like the idea of a short compact spaceport, we have the problem of building and operating a fleet of Gargantuan two stage shuttle vehicles with high mass ratio. (The mass ratio of a rocket is the ratio of the mass at lift-off to the mass at burn-out and is related to the exhaust velocity c and the mission velocity v by the expression $r = e^{v/c}$.)

As a first approximation to an optimal trade-off point we choose the median in which the vehicle delivers half of the orbital velocity and the spaceport delivers the other half. In doing so we have shrunk the length of the spaceport landing track by a factor of four, to 150 kms, and reduced the mass ratio of the shuttle vehicle to the square root of what it would have to be to do the job alone.

MAGNETIC CAPTURE

Even with a 150 km runway, how can a vehicle traveling at thousands of meters per second ever manage to "land"? Obviously it can't depend on wheeled landing gear and mechanical brakes. At the speeds involved, any physical contact between moving surfaces would simply vaporize both surfaces. We have to have some way to arrest the incoming lighters without touching them until they have virtually come to a stop. The problem resolves into two parts: (1) guidance and suspension of the vehicles along the

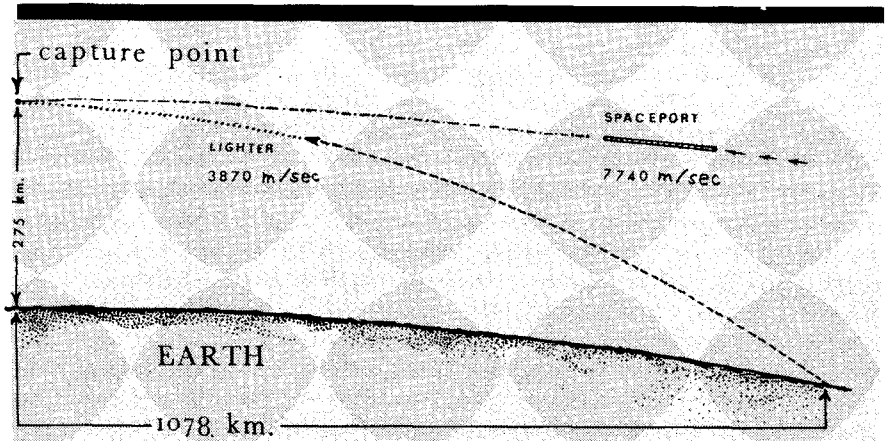

FIGURE 2: Spaceport About To Capture Small Freight Vehicle Called A Lighter. We are looking from the Northern hemisphere toward the equator. Notice that the faster spaceport overtakes the lighter. The one-ton lighter enters the leading edge of the spaceport and is accelerated electromagnetically while the more massive spaceport decelerates slightly. The drawing is to scale; the Earth's radius is 6378 km, the spaceport's length is 150 km, the trajectory of the lighter has an eccentricity of ¾ and a "perigee" of 950 km.

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landing track, and (2) braking the vehicles.

If a magnet moves rapidly above a conducting surface, the moving field induces currents in the conductor that create a mirror image of the generating field. The mirror image opposes the generating field and causes a repulsion. This makes for an ideal suspension system, because the closer the generating magnet comes to the surface over which it moves, the closer it comes to its mirror image and the stronger the repulsion. A vehicle using the generating magnets in place of wheels effectively rides on invisible massless springs. They cushion it without ever allowing it to contact the surface of the track. The speed of the vehicle is irrelevant so long as the track is straight.

Superconducting coils aboard the lighter which provide the generating field for the magnetic suspension system also provide the "handles" for braking the vehicle. The principle employed is that of a linear synchronous motor/generator.

When a current flows through a wire in the presence of a magnetic field, a force is exerted on the wire in the direction perpendicular to both the current and the magnetic field. An equal and opposite force is of course exerted on the magnet that generated the field. Normally either the wires or the magnets are connected to a central shaft so that the forces produce torque and cause the shaft to rotate. That is the principle of an ordinary electric motor. But we don't have to use that arrangement. The magnets can be installed in a carrier of some sort, in this case our lighter, and the wires can be arranged along the path of the carrier in the manner of crossties on a railroad track.

When current flows through the wires, a force is exerted between wires and magnets that can accelerate or decelerate the carrier directly, without any need for drive wheels or cogs or whatever. We then have a linear electric motor. If we introduce sensors and switches so that only the wires over which the carrier is passing at any moment are carrying current—a necessity if we want to achieve reasonable efficiency—then the motor is called a linear *synchronous* motor.

Such motors are being studied extensively for rapid train service on Earth and under the name of "mass driver" are being developed for accelerating loads in space. Successful working models of "electric guns" were built more than forty years ago.

Today mass drivers are being considered as devices to deliver mineral ores from the surface of the moon at low cost, and as electrically powered reaction engines for space "tugs." In both of these modes mass drivers accelerate packages that are released near the end of a straight track and fly on at high speed. The idea of using one in reverse to "catch" packages—namely our spaceport lighters—is novel but not at all unfeasible. The principles of operation are the same, except that instead of consuming power, a mass driver operating as a catcher acts as a generator. In fact the power generated in

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arresting the arriving lighters provides a good part of the power needed to accelerate the returning vehicles along a parallel track. This is the key to the efficiency of the overall system.

TO CATCH A RISING STAR

Our lighter must reach an exact point in space several hundred kilometers from its launch site at the exact moment the spaceport passes with its landing track. If its position and velocity are just right, the lighter will be lined up with the track and will lock onto it, shooting down the track at half orbital velocity, 3870 m/sec, braking furiously to come to a rest at the end of the track. The slightest error, however, and lighter and spaceport will collide, producing a spectacular wreck.

There are several considerations that make the possibility of solving the guidance problem a little less incredible than it might otherwise seem. To begin with, the lighter makes a rendezvous with the spaceport well above the atmosphere in an environment where no random forces disturb its trajectory. There the ideal laws of motion are obeyed with mathematical precision and predictability. Secondly, the accuracy required—while great—is not the kind of accuracy involved in hitting a pinhead at some outrageous distance with a rifle. The lighter is not a passive projectile that must be aimed with absolute accuracy from the start. It is an active vehicle that continuously adjusts its thrust vector according to feedback from a guidance device. Finally, guidance does not depend on human senses and human reflexes, but on precision electronic sensors coupled to high speed computer circuits.

There are basically three elements that make up a guidance and control device: (1) a measurement system that determines where the vehicle is and what it is doing at any given moment, (2) a computational system that looks at the difference between where the vehicle is and where it is supposed to be and figures out what to do about it, and (3) an actuator system that implements the commands from the computational system. The computer and actuator are essentially off-the-shelf technology, while the measurements can be accomplished by predictable developments in multiple beam microwave interferometry.

Range measurements are normally made by timing the travel of a microwave or laser pulse from the rangefinder to the target and back again. Because of fuzziness in the pulse envelope, this method is generally good only to a few tens of centimeters and requires repeated pulses even to get that. With a continuous beam, on the other hand, the phase angle between the return signal and the outgoing signal gives the distance to a fraction of a wavelength—only it is a fraction plus some unknown integral number of wavelengths. If there is a second continuous beam of a slightly different frequency, one gets a set of simultaneous equations that can be solved for the unknown number.

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Thereafter, it is only necessary to count interference fringes to have continuous monitoring of the distance to a fraction of a wavelength.

When this is done from three different reference points, the lighter's position with respect to the three reference points is known precisely at any time. Of course at these accuracies there are all kinds of correction factors to worry about—transponder antenna characteristics, delay paths within the transponder, orientation of the lighter, and so on, but no fundamental problems.

The use of the position information for guidance is straightforward. Mission control picks the exact time for touchdown and the exact position and velocity vector that the lighter must have. Then the equations of motion are integrated backwards to get position as a function of time for a perfect trajectory. From there it is just a matter of telling the lighter where it is at any time relative to where it is supposed to be. The lighter closes in on the imaginary moving point that represents exactly the free fall trajectory it needs for a perfect capture by the spaceport.

If for any reason the vehicle fails to achieve this moving rendezvous within a given margin of time prior to touchdown, then the contact is aborted. The cutoff could be as much as half a minute before touchdown, giving emergency retros on the lighter plenty of time to kill its upward velocity and keep it well away from the spaceport.

THE LIGHTER

To meet the spaceport at half orbital velocity the lighter needs a mission velocity of about 5000 m/sec. This is typical of an intermediate range ballistic missile. A velocity of 4490 m/sec is required at the Earth's surface to reach 3870 horizontal m/sec at 275 kms. The lighter picks up 410 m/sec by lifting off from Cape Canaveral toward the east—more if it takes off at the equator—but loses about 1000 m/sec to air resistance and gravity.

Assuming a single stage vehicle our mass ratios for this mission would be (about) 5 for oxygen/kerosene propellant, 4 for oxygen/methane propellant, and 3 for oxygen/hydrogen propellant. Mass ratios of 25, 16, and 9 respectively would be required if we intended our lighter to go into orbit without help from the spaceport. Even though hydrogen gives us a lower mass ratio, we prefer more compact fuels like kerosene or methane because they make our vehicle less bulky and reduce our propellant/tankage weight ratio.

It is worth noting that given a mass ratio of 5 we are at the energy optimum for *all* rocket missions in terms of the percentage of energy used that is imparted to the empty vehicle-plus-payload. If our mass ratio is smaller than 5 it means we are using a high exhaust velocity for the mission and since energy is a velocity squared factor, a large proportion of our energy is being bled off into the fast exhaust

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gases. If our mass ratio is greater than 5 it means we are being prolifigate with reaction mass. Even though our exhaust velocity is low, and each unit of our reaction mass carries away little energy, so much reaction mass is being used that the exhaust gases absorb a large proportion of the available energy. If energy is cheap and reaction mass is expensive we favor high exhaust velocities. If energy is cheap and reaction mass is cheap we may use low exhaust velocities. If energy is expensive we stick as close as we can to a mass ratio of 5.

An oxygen/kerosene vehicle with a mass ratio of 5 is a comfortable one to work with, requiring little new technology over a wide size range. We wish to work the small end because a smaller rocket can be handled by a less massive spaceport. Our baseline design assumes a lighter with a gross liftoff weight of 5000 kg that delivers to the spaceport 500 kg of vehicle and 500 kg of payload.

The simplest design for such a craft is a pointed cylinder seven or eight meters long and one meter in diameter with superconducting coils running around the circumference at axial intervals of about ten cms. If this vehicle proves too clumsy to return to the ground stations, we can go to a folding wing vehicle that flies back to the launch site under autopilot using cruise missile technology now under development. The superconducting coils of the accelerators can be located in triple spines at the rounded corners of a "triangular" cross section, the mates of corresponding drive tracks in the spaceport's mass driver.

Although the lighter is capable of achieving its mission on rockets alone, we can make use of its wings and superconducting drive coils for a mode of operation that would per-

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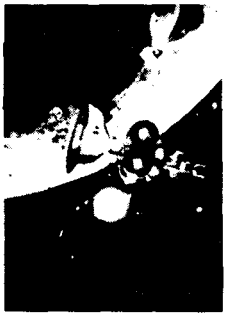

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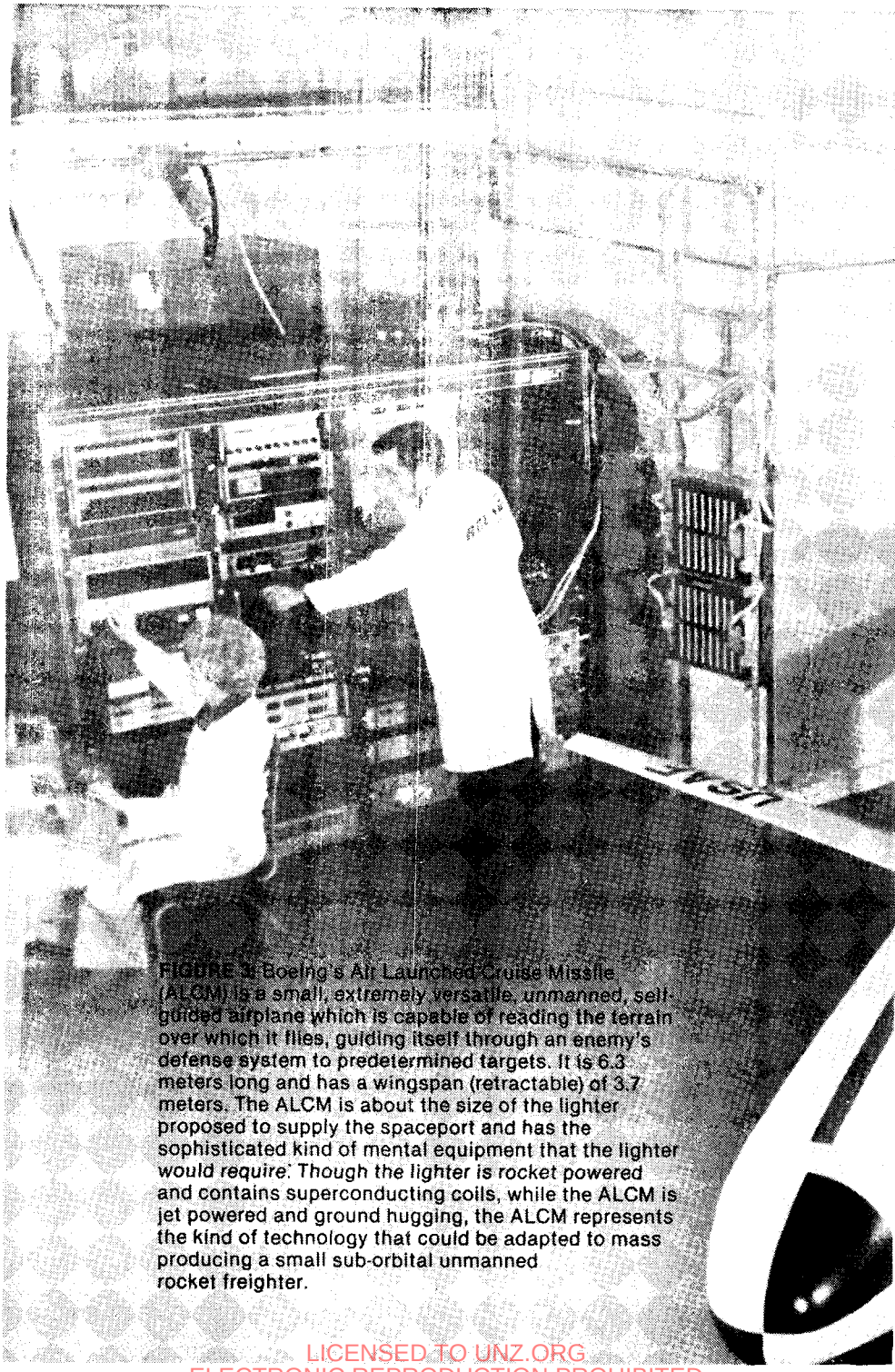

FIGURE 3: Boeing's Air Launched Cruise Missile (ALCM) is a small, extremely versatile, unmanned, self-guided airplane which is capable of reading the terrain over which it flies, guiding itself through an enemy's defense system to predetermined targets. It is 6.3 meters long and has a wingspan (retractable) of 3.7 meters. The ALCM is about the size of the lighter proposed to supply the spaceport and has the sophisticated kind of mental equipment that the lighter would require. Though the lighter is rocket powered and contains superconducting coils, while the ALCM is jet powered and ground hugging, the ALCM represents the kind of technology that could be adapted to mass producing a small sub-orbital unmanned rocket freighter.

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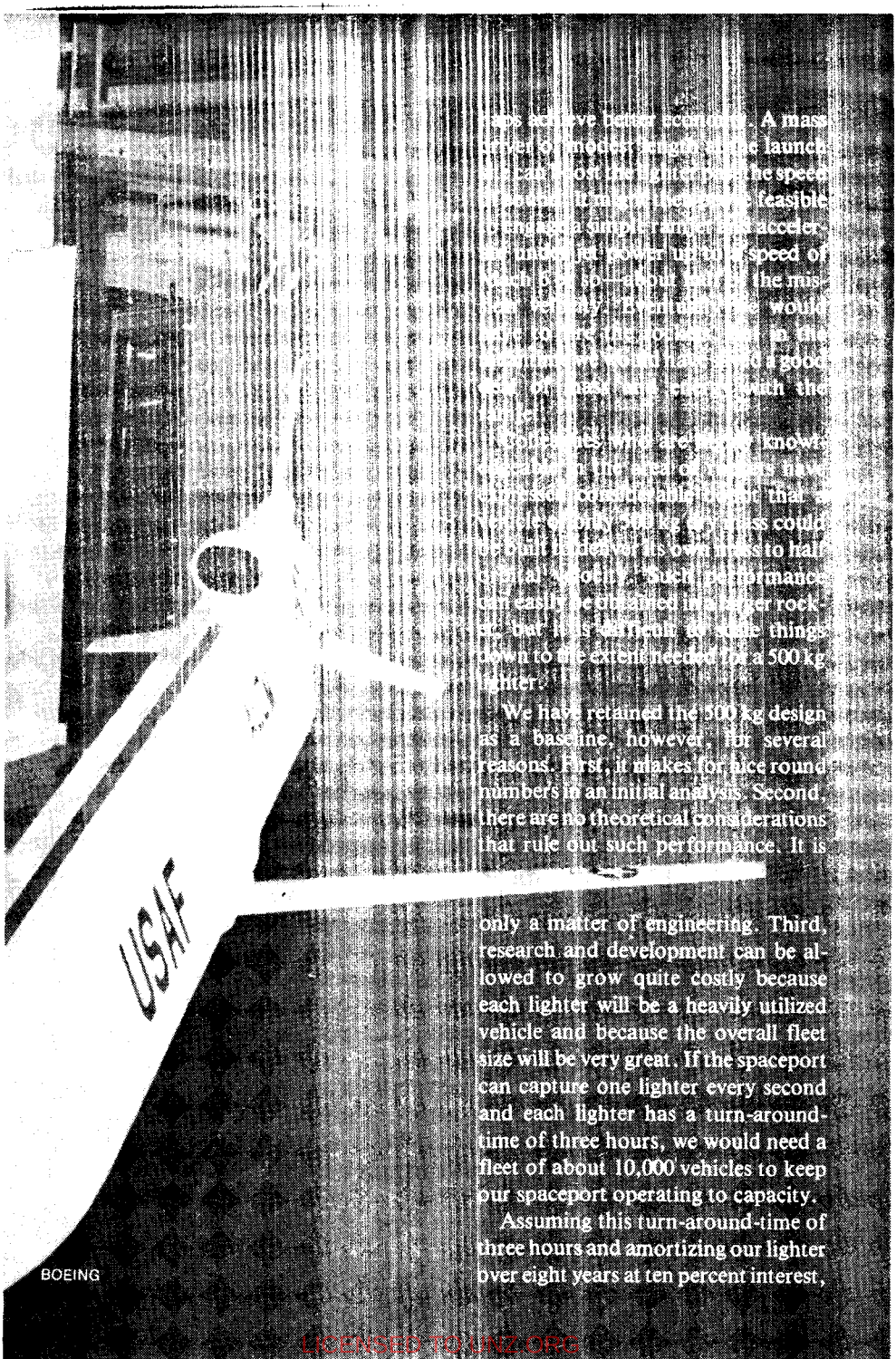

only a matter of engineering. Third, research and development can be allowed to grow quite costly because each lighter will be a heavily utilized vehicle and because the overall fleet size will be very great. If the spaceport can capture one lighter every second and each lighter has a turn-around-time of three hours, we would need a fleet of about 10,000 vehicles to keep our spaceport operating to capacity.

Assuming this turn-around-time of three hours and amortizing our lighter over eight years at ten percent interest,

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gives a vehicle use-cost per delivered kilogram of 13 *cents* for every million dollars worth of lighter. Boeing has estimated that a low orbit delivery cost of 20 *dollars* per kilogram would allow construction of solar power satellites competitive with coal fired power. So the price of our vehicle will not be a dominant cost. We can afford to put more work into miniaturization than has been justified in the past. We can afford a sophisticated guidance system. We can afford superconducting coils.

ACTIVE CONTROL

One of the largest space structures which has undergone serious analysis is the solar power station. Boeing's design, for instance, masses as much as a battleship, 80,000 tons, and covers an area 22 kilometers by 5 kilometers, about the length and breadth of Manhattan Island. We are proposing a spaceport seven times as long and substantially narrower. Such a long thin structure presents engineering problems.

If we treat the case of the capture of a single lighter we see that energy is available, which can be bled off electrically, and that momentum is exchanged at the moving point of contact. Normally momentum induced capture forces would spread throughout the spaceport from the contact point at the speed of sound in our structure. However, in this case, as the lighter slows to the speed of sound in the spaceport, a shock wave builds up around the lighter that would, unless negated, destroy the interface portions of the spaceport.

The problem can be solved by giving the spaceport an electrical nervous system, electromagnetic muscles, and intelligence enough to respond to the lighter as would a martial arts master. A karate chop will break a passive brick but it will not break the head of an alert black belt samurai.

To prevent lateral buckling, which is a weakness of long structures under compressive stress, we employ an active control system. Any small amount of lateral bending is sensed by this control system. A lateral restoring force is immediately applied electromagnetically that is many times larger than the natural elastic restoring force at the small displacements measured by the sensor. Our spaceport thus has the brains and muscle to simulate "infinite" stiffness.

Another problem is longitudinal waves. To prevent dangerous waves from building up and whipping back and forth through the spaceport we need control over longitudinal springiness. Again the spaceport's brains and electromagnetic muscles allow it to generate waves within itself which can be constructed so as to cancel the waves created by capturing the lighter. Prior to a capture the spaceport gathers itself up into its shortest length, then, just before the lighter makes contact, it starts expanding. Its head sections leap forward to meet the lighter and an anticipatory expansion wave is generated that precedes the lighter down the track. The braking force of the lighter

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is not directly transmitted from section to section. Rather it serves to kill the leap given to the section by the expansion wave. The spaceport "rolls with the punch" so to speak. There are variations of the strategy depending upon how many lighters are being captured and ejected at any one time.

The control system can also handle the gravitational gradient instability. A long skinny structure in space prefers to align itself with the gravitational gradient—up and down relative to the Earth. The horizontal position is only metastable—like a notions tray carrying a few ball bearings balanced on a knife edge. If the spaceport drifts a fraction off the horizontal position, the gravitational gradient will tend to accelerate the drift in much the same way that it generates tides. Though all sections of the spaceport are tied to a common velocity, once the spaceport "tips," each section is at a different distance from the Earth and so tries to follow a conflicting orbit around the Earth. The low sections are moving too slow to maintain a circular orbit and fall inward, while the high sections are moving too fast to maintain a circular orbit and fly outward. This conflict is only resolved by the vertical position where all the disturbing forces act through the center of mass.

Such a drift from the horizontal can be countered with rockets, of course, but a more economical way is to use the control servos. Orbital motion gives the spaceport a certain angular momentum. Suppose this long structure has a small excess of angular momentum. It is rotating a little too fast for its orbital period, so that the leading edge is drifting below the mean orbital path, while the trailing edge is drifting above. To compensate the spaceport stretches in length. The moment of inertia is thereby increased. The rotation rate is slowed by a corresponding amount, like a skater extending her arms to slow her spin. Now the motion is reversed; the leading edge rises and the trailing edge falls. The spaceport contracts to stop the drift, but leaves its trailing edge low until the gravitational gradient has subtracted enough angular momentum to cancel the original excess. Another contraction and expansion brings the spaceport to the required horizontal position with the proper rotational velocity.

ECONOMICS

Deciding whether a device will work and deciding whether it is economically viable are two different questions. The spaceport is a workable transportation system. But to ask if it will pay for itself poses a peculiar double bind. What the *first* spaceport must charge for freight depends upon its construction costs which in turn depend upon high-cost rocket transport such as the Rockwell Space Shuttle.

Perhaps the best first approximation to make is in terms of the ratio of the delivery cost of freight to the spaceport and the delivery cost of freight to low orbit by rocket. If this ratio is less than one, then constructing a spaceport with rockets will automatically make the rockets obsolete, providing, of course,

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the charge made by the spaceport to deliver payload will sustain the volume of traffic that the spaceport would have to have.

Using the above ratio we can generate the following inequality

$$MT < 143 \times 10^6 F$$

where M is the mass of the spaceport in tons, T is the average period in seconds between delivery of the 500 kg payloads and F is the fraction of revenues that can be applied to the costs of transporting the spaceport's mass into orbit, amortized over 25 years at 10 percent interest. Immediately it becomes obvious that spaceport mass must be minimized and payload delivery rates kept high.

There are no technical reasons why the spaceport cannot accept payloads around the clock at the rate of one lighter per second; however, we must not expect such a high use-rate initially. First a distributed series of launch sites must be established around the Earth, near the equator. Second, we must have assembled in space enough power generating and storage capacity to maintain the spaceport's momentum balance.

Our baseline design is for a system that receives 1000 kg loads at half orbital velocity (3870 m/sec relative to the spaceport) and returns 500 kg loads at negative orbital velocity (7740 m/sec relative to the spaceport, or zero velocity relative to the Earth). If the arrival and return rates are one vehicle per T seconds, then we require a power input of 8000/T megawatts. Even to handle one lighter every four seconds demands the electrical generating capacity of a Hoover Dam. Where such power will come from will be dealt with in the next article of this series.

What kind of estimates can we get for the spaceport's mass? Assuming that the driver for the return vehicles is adjacent and parallel to the one for the arriving vehicles, it is fairly easy to show that the structure as a whole is under tension. From this we can derive the mass of the main structural cable.

Visualize the stream of braking lighters. They are bunched toward the spaceport's tail according to the following equation

$$x = 3.87t - .025t^2$$

where x is the distance in kilometers from the front of the spaceport and t, in seconds, varies in increments of T. Sixty percent of the braking lighters will be in the last thirty percent of the spaceport, each exerting a force of 50,000 newtons in a direction which tends to pull the tail of our beast. The stream of returning lighters (half as many but twice as fast) are bunched toward the spaceport's front according to the equation

$$x = 0.1\,t^2$$

each exerting a force of 100,000 newtons in a direction which tends to pull on the head. We have a tug-of-war and hence: tension.

The maximum tension

$S_{max} = 0.83\ Lma/(vT)$ newtons

will occur at the center. L is the length of the spaceport, m is the mass of the arriving lighters, a is the acceleration of the arriving lighters, v their arrival velocity, and T the period between arri-

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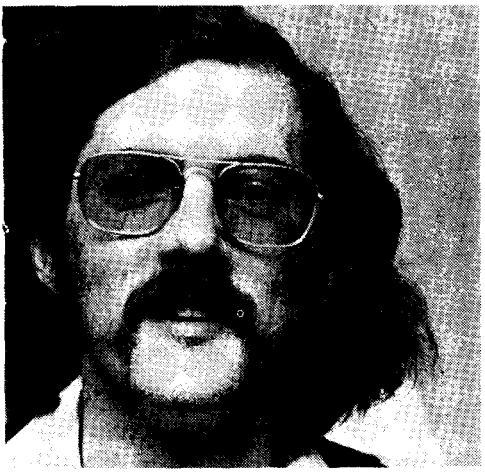
BIOLOG

by Jay Kay Klein



Kevin O'Donnell, Jr.

Kevin O'Donnell, Jr. became a science fiction writer in lieu of becoming a lawyer. While still at Yale, where he majored in Chinese Studies, a favorable rejection slip from Analog decided Kevin to cancel his postgraduate law school matriculation. A year later, sure enough Analog bought his very first saleable story, appearing in the October, 1973 issue. Since then, he's been a regular contributor.

His genesis as a writer sounds curiously like many others before him. He'd been reading between five and ten science fiction paperbacks a week, and often exclaimed that he could write better stories than most of the tripe at hand. Kevin's roommate, an English major and Rhodes scholar, encouraged him to try.

The life of a full-time writer also seems to have special compensations, including being your own boss, working at home, not having to wear a suit and tie, and earning good money. Among Kevin's earlier occupations can be listed dining hall manager, maid, assistant lecturer in English at Hong Kong Baptist College, and secretary.

Born and raised in Cleveland, Kevin has lived a couple of years in Seoul, Hong Kong, and Taipei, settling down the past several years in New Haven, Connecticut. The Cleveland years were filled with four brothers and three sisters. In New Haven, Kevin has the company of wife Kim Tchang, a former classmate. Work in hand includes a first novel contracted to Bantam Books, with a working title of Passport to My Soul.

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vals. If we assume the extreme case where T is one second, then S_{max} is 1.6 million newtons. Let this tension load be taken by kevlar cables which have a safe operating strength to weight ratio of a million newton meters per kg, a 2:1 safety factor. Then the total mass of the main tension member comes to 240 tons. That is about ten Space Shuttle payloads, or two payloads for the heavy lift launch vehicle derivative of the Shuttle. To put it in better perspective, however, consider this: when the spaceport becomes fully operational, it will take a mere eight minutes to deliver payload mass equal to this main structural cable!

Obviously the main tension cable will not be the whole of the spaceport's structural mass, or even a very large part of it. Stiffening members, local supports for the drive coils, and the active control structures will add mass at least several times that of the main cable. The various electrical components—particularly the drive coils and power buses—demand many times again as much mass. However, there is no need to detail the mass estimates for these subsystems because the "bottom line" should be clear—the total mass of the system is going to be small compared with its annual delivery capacity.

We can conservatively estimate the mass of the spaceport to be 50,000 tons plus the solar power arrays. Solar power comes at about 8 tons per megawatt but since the spaceport will be in shadow half the time we will need 16 tons per megawatt and so our total spaceport mass estimate is something like 50,000 + 128,000/T tons, where T is the average interval in seconds between lighter captures. The annual payload delivered will be 15/T million tons. Thus the ratio of yearly-payload to spaceport-mass is approximately 300/(T + 2.5). Even if the spaceport were operating at only one percent of capacity, it would still deliver several times its own mass to orbit every year.

NEXT MONTH

This first article has been a spare overview of the physics of building a system which can provide us with medium cheap access to space. The second article will explore some of the astounding consequences. Medium cheap space travel will allow us to tap into an energy source vast enough to power a space program of a magnitude that even the most ardent space buff has not dared to dream. ■

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general design principles for mass drivers, methods for thrust calculations; develops bucket design for 20 kg payloads accelerated at 100 g's. Cites feasibility of 25,000 A/cm^2 current density in superconducting coils based on magneplane experience. Gives figures for cryogenic cooling system based on properties of supercritical helium.

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ABOUT THE AUTHORS

Donald Kingsbury is well known to Analog readers as a writer of both fact and fiction; he is also a professor of mathematics at McGill University in Montreal. Roger Arnold is an aerospace software engineer near Seattle, with a long-standing interest in space; he is also Vice-President of the Northwest L-5 Society.

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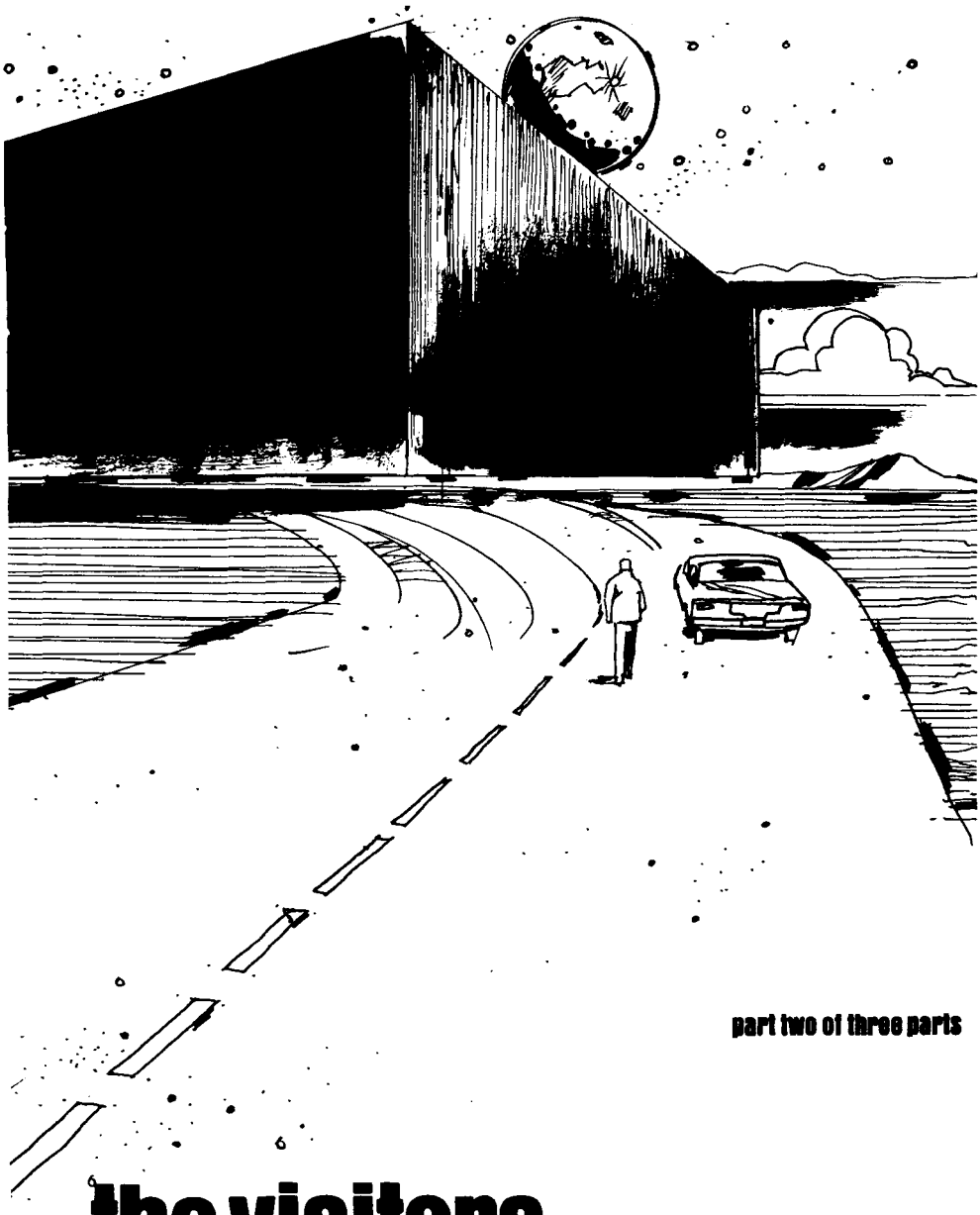

part two of three parts

the visitors

by CLIFFORD D. SIMAK

Communication might seem the first problem in first contact. But that doesn't mean it's easy.

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SYNOPSIS

A black box the size of a large building lands at the small town of Lone Pine, Minn. In landing it crushes a car that has been left near a bridge by Jerry Conklin, who is fishing a pool below the bridge. A Lone Pine resident fires at the box and is killed when the box fires back. Conklin, a graduate forestry student at the University of Minnesota, is seized by a tentacle extruded from the box and hauled inside it. He is mystified, tells himself this may be a creature out of space. His attempts to communicate with it fail, but he does get the impression the box somehow is akin to a tree and receives a stong impression of home, which he believes may be an attempt by the box to communicate with him. Finally the box throws him out, but by this time the box has moved into a deep forest across the river, night has fallen, and Conklin, unable to find his way out, is forced to spend the night in the woods.

In the meantime Frank Norton, owner and editor of the weekly paper at Lone Pine, phones his old friend, Johnny Garrison, city editor of the Minneapolis Tribune, *to tell him about the landing. Garrison sends Kathy Foster, a reporter, and Chet White, a photographer, to Lone Pine to cover the story. Kathy is Conklin's girl friend; she and Conklin had planned to attend a concert that evening and she has been upset that Conklin has not phoned her. She resists the Lone Pine assignment, but finally agrees to it.*

In Washington, D.C. President Herbert Taine is informed by Gen. Henry Whiteside, Army chief of staff, that a tracking station has discovered an unknown satellite. Early indications are that it is too massive to have been launched from Earth. David Porter, the White House press secretary, gets word of the Lone Pine landing and carries it to the President. The two of them speculate that the landing and the new satellite may be connected. If the big box at Lone Pine actually is an extraterrestrial visitor, as seems possible, the satellite may be its mother ship. They agree that federal investigators must be sent immediately to Lone Pine. They also agree that an alien visitor is something they can get along without. The administration has enough trouble without taking on more.

Porter phones Alice Davenport, daughter of a senator who is not friendly with the administration. Porter was to have taken Alice to dinner, but the Lone Pine incident has made that impossible. He also talks with Alice's father, the senator, who insists that if the Lone Pine visitor is an alien the United States must seek whatever advantages it can from its alien intelligence and technology and put them to the nation's use.

Kathy and Chet arrive at Lone Pine late; the roads are jammed with cars trying to reach the town and the state police are trying to seal the area off. By the time they arrive the visitor has crossed the river and entered the forest. Next morning, however, Kathy

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is awakened by Norton who tells her the visitor is eating trees. It is doing exactly that, eating a swath through the forest, converting the wood to cellulose and spewing bales of cellulose out behind it. While reporters are watching and wondering over this strange happening, Kathy wanders close to the edge of the forest and someone hisses at her. It is Conklin. He still is wearing waders and fears that because of this he may be recognized as the man whose car has been crushed. He shuns identity because he does not want it known that he had been "taken up" by the visitor, he does not wish to be another kook associated with flying saucers. Kathy gets him shoes to replace the waders, arranges for Chet to take him to a nearby town where he can catch a plane to Minneapolis.

In Washington cabinet members and the President's staff get into a hassle over what the administration should do. This is a situation without precedent and everyone is up in the air. A shuttle sent out from a space station finds that the new satellite is a huge cluster of other visitors, apparently waiting word from the one at Lone Pine before they, too, come down to Earth.

The nation, despite the administration's fear of a panic, had remained calm, but the news about the cluster of visitors creates near-panic in the White House.

16. LONE PINE

Stiffy Grant shuffled into the Pine Cafe, hoisted himself onto one of the stools at the counter. At the sound of the slamming front door, Sally came out of the back. She wiped the counter with a damp cloth.

"You working in the morning?" asked Stiffy. "I thought Judy worked in the mornings."

"Judy has a cold," said Sally, "so I'm filling in for her."

The place was empty except for the two of them. "Where's everyone?" asked Stiffy. "With all the people who are in town..."

"They sleep late," said Sally. "Those who are here. A lot of them are staying in Bemidji, driving here and back. There's no room for them here."

"Those two folks from the *Tribune* are here," said Stiffy. "The camera fellow and that girl writer."

"They got here early when there was still room at the motel."

"They're all right," said Stiffy. "Real white folks. That girl gave me five dollars for just answering a phone and then hanging on so no one else could get the line. Yesterday, the camera fellow slipped me a bottle for keeping watch of what was going on across the river so he could grab some sleep. Was supposed to run and wake him if anything happened. But nothing did. Good liquor, too. None of your cheap stuff."

"Most of the folks are nice," said Sally. "They tip good. Most folks around here don't tip at all."

"They ain't learning much, though," said Stiffy. "There don't

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seem much to learn from that thing out there. The men from Washington are working real hard at it and not coming up with much. I talked with one of them the other day. He'd been pawing through some of the rubbish the thing is throwing out, what's left after it makes those bales of white stuff. He was all excited about what he was finding but it didn't sound like much to me. He said he wasn't finding any pine seeds, or almost none. The cones had been broken up and the seeds were gone. He said that was unnatural. He seemed to think the thing was collecting the seeds and saving them. I told him maybe the thing was eating them; squirrels and such eat them. But he shook his head. He didn't seem to think so."

"What can I get you, Stiffy?"

"I guess some cakes."

"Sausage or bacon?"

"Naw, you charge too much for them. I can't afford it. Just the cakes. And plenty of syrup. I like lots of syrup."

"The syrup is there in the pitcher. You can use as much as you want."

"All right. Plenty of butter, then. A little extra butter. But don't charge me for it."

Sally went back into the kitchen to give the cook the order, then came back.

"How far has the visitor cut into the woods?" she asked. "I haven't seen it for a while."

"More than a mile, I'd say. It moves right along, day and night. Spitting out those bales of white stuff every few minutes. Leaving a long trail of them behind it. I wonder why it's doing that. It don't make no sense to me. Nothing about it makes any sense to me."

"There must be a reason for it."

"Maybe there is, but I don't see it. I wonder, too, why it picked us out."

"It had to be some place. It just happened to be us. If it was trees it was looking for, it picked a good place."

"I imagine," said Stiffy, "them forestry people ain't too entranced with it. They set a lot of store by them trees. I don't see why. They're just trees, like any other trees."

"It's a primitive wilderness area," said Sally.

"Yeah, I know," said Stiffy. "A lot of foolishness."

17. LONE PINE

The visitor had gotten lumpy. It had bumps all over it, but it kept on chopping down the trees and masticating them, or at least ingesting them, and at regular intervals the rear section of it slid up, ejecting bales of cellulose and great gobbets of waste from the chewed-up trees.

"We don't know what is going on," one of the two troopers told Kathy. "Maybe some of the people from Washington do, although I'm inclined to doubt it. They're not talking, so we don't know if they do or not. The lumps on the visitor were there this morning when it got light enough to see. They must have started in the night and they've been growing ever since. They are a lot bigger than

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they were when I first saw them."

"Any reason why I can't get closer?" asked Kathy. "Some of the other newsmen are."

"Just watch yourself," said the trooper. "Don't get too close. We don't want people getting hurt."

"The visitor has made no move to harm anyone," she said. "We've been practically living with it ever since it landed and it doesn't even notice us."

"You can never tell," the trooper said. "If I were you, I wouldn't push my luck. It killed a man, remember?"

"But he shot at it."

"Even so, I don't trust it. Not entirely, that is. This ain't one of us."

Kathy and the troopers stood midway between the visitor and the river, now spanned by the temporary structure laid down by the army engineers. Behind them and in front of them the wide swath cut through the forest by the visitor was littered with white bales and clumps of tree debris. Both the bales and the debris were regularly spaced, laid out very neatly.

"The other troopers," said the trooper, "are holding the sightseers on the other side of the river. We're only letting in the official people and the press. You people know you're here on your own responsibility. That's been explained to you."

"Yes, of course, it has."

"I don't see," said the trooper, "how all these sightseers got here. There seems to be a couple hundred of them. We have all the roads blocked. But they just seep through, sort of."

"They park their cars short of the road blocks," Kathy said, "and walk in through the woods. It would take a picket line to keep them out."

"I suppose so," said the trooper. "They can be a nuisance."

"Here come Frank Norton and Chet, my photographer," said Kathy. "As soon as they reach here, we'll be going in."

The trooper shrugged. "Take it easy, now," he said. "Something's about to happen and I don't like it. I can feel it in the air."

Kathy waited for Norton and Chet to come up and the three of them walked up the swath.

Kathy asked Chet, "Did Jerry get on the plane all right?"

Chet nodded. "We just made it. Only minutes to spare. I gave him the film, and he'll deliver it. Meant to ask you—how come he showed up here? I seem to remember he turned up missing and you were hunting him."

"His car broke down and he walked into Lone Pine, looking for a phone. We ran into one another. It was a surprise to the both of us. Neither of us knew the other one was here."

"Seems to be a nice guy."

"Yes, he is."

"Not very talkative, though. Didn't have much to say."

"He never does," said Kathy.

They walked up on a group of newsmen clustered to one side of the visitor.

"Did you talk to Johnny this morning?" Kathy asked.

"Yeah, I did. Checking on the film. He said someone delivered it, in plenty

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of time for the first edition, to the photo lab."

"He didn't say anything about sending someone up to replace me?"

"Not a word. Did you expect he would?"

"Well, I don't know," said Kathy. "There are others he might think would do a better job. Jay, for instance. He only pointed the finger at me because there was almost no one else in the newsroom at the time."

"I don't think you need to worry any. Johnny is a fair man. As long as you do the job, he will leave you here."

"If he tried to send someone else," said Kathy, "I'd yell like hell. This is my story, Chet, and I mean to keep it that way."

"You'd fight for it?"

"You're damn right I would."

"Look," said Norton, "someone has painted a number on the visitor. See it. It reads 101. On the side, up near the front of it."

Kathy looked and saw the number, in green paint, the numerals a foot high or so.

"I wonder who did that," she said.

Chet snorted. "One of them jerks from Washington, most likely. One of them observers. Science types. They got to have everything numbered for the record."

"It seems a funny thing to do."

"We can't presume to judge how the observers go about their work," said Norton. "There probably is a valid reason for the number."

"I suppose so," said Kathy.

"You have any idea what those lumps may be?" asked Norton.

Kathy shook her head. "I can't imagine. It's a shame. It was such a nice, neat thing before, so symmetrical, and now it's got all lumpy."

"You sound like you thought it was pretty."

"Maybe not pretty. But appropriate. The kind of thing you'd expect to come from space. Nice, neat, not spectacular."

"Good Lord," said Norton, "will you have a look at that!"

One of the larger lumps that had grown on the visitor was beginning to burst open and from it was emerging a small replica of the visitor. The thing that was emerging from the lump was three or four feet long, but, except for its size and for the absence of bumps on it, it was an exact copy of the big black box. The lump lengthened and widened even as they watched and the thing that was emerging from it fought free and came tumbling to the ground. It landed and rolled and came upright. It was a shiny black, not the deep black of the visitor, but shiny as if it might be wet. For a moment it crouched on the ground, unstirring, then swiftly it wheeled about and set itself in motion, racing toward the back of the visitor, flowing smoothly and silently.

The group of people surged back to clear the way for it. A TV cameraman was shouting savagely, "Down in front. Down in front, goddammit. Get out from in front of the camera. Give me a chance, will you?"

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Kathy, backing away with the others, was thinking furiously: That settles it! It is biological. Not a machine, but a biological being. A live creature, for it is giving birth. It is having babies!

Another of the lumps was splitting open and another small replica of the visitor was fighting free of it. The visitor, itself, was paying no attention to what was taking place. It went on chomping trees.

The first baby to emerge whipped around the rear of the visitor, heading for one of the bales of cellulose. It reared up and attacked the bale, tearing it apart, gulping down the cellulose in much the same manner as its "mother" was gulping down the trees.

Chet was racing toward it, his camera lifted and ready. Sliding to a stop, he braced himself, plastered the camera to his face and began shooting pictures, sidling along after a few exposures to get shots from different angles. Other cameramen also were running frantically, joggling one another for position, forming a ragged circle around the little creature.

"I should have guessed," said a man standing beside Kathy. "When I saw those lumps I should have known. The thing is budding. And that answers the question all of us have been asking ourselves..."

"That's right," said Kathy. "It's biological."

He looked at her, apparently for the first time. He raised a hand and touched it to his forehead in salute.

"Quinn," he said. "New York *Times*."

"Foster," said Kathy. "Minneapolis *Tribune*."

"You got here early then," he said. "From the first, I would suppose."

"Late on the day it landed."

"Do you realize," he asked. "that we may be covering the story of the century. If not of all time."

"I hadn't thought of it," said Kathy.

Then, ashamed, she said, "I am sorry, Mr. Quinn. I was being flippant. Yes, I had thought of it."

There were more of the babies now, running wildly to find the bales so that they might feed. The newsmen and photographers were scattering, no longer huddled in a group.

One of the babies had fallen and was not running. It lay jiggling and quivering, like an animal that had fallen and was struggling to get up. It lay close against the visitor, but the visitor was paying no attention.

It's fallen on its side, thought Kathy. The poor thing has fallen on its side and can't get to its feet. Although how she might know this, she did not know, for, truth to tell, there was no way one could know. No one could tell which part was top or bottom.

Quickly she stepped forward and, stooping, laid hold of it and tipped it. Swiftly, it flipped over and quickly scurried off, heading for the bales.

Straightening, Kathy reached up a hand and patted the barn-like side of the visitor.

"Mother," she said, softly to

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herself, not really speaking to the visitor, for how was the visitor to hear? "Mother, I helped your baby to its feet."

Underneath her hand, the hide of the visitor twitched and then folded over to grasp her hand, still against its side, folding over gently, covering her outspread hand, to hold it for a moment. Then the hide unfolded and became hard and smooth again.

Kathy stood stricken, shaken, not believing it had happened.

It noticed me, she thought in a wild panic of churning emotion. It knew I was here. It knew what I had done. It tried to shake my hand. It was thanking me.

18. WASHINGTON, D.C.

"What do you have on this pupping business?" the President asked Porter.

"Pupping, sir?"

"Yes, the visitor out in Minnesota, having pups."

"All that I have is on the wires," said Porter. "Fourteen of them so far, and a few more to go."

"A fair litter," said the President.

"You probably know more than I do about it," the press secretary said. "Dr. Allen has his men out there. He probably has reported to you."

"Yes, of course he has. But Allen is an old woman and those observers of his are thin-lipped science people. They won't tell you anything until it's all nailed down. They won't tell you what they're thinking because if they were wrong, their beloved fellow scientists would laugh them out of court. What they do tell you is so filled with scientific lingo and so many ifs and maybes and so much double-talk, you can't tell what they mean."

"You can't mean that Dr. Allen is incompetent," said Hammond. "He is a top-notch man. He has the respect..."

The President waved his hand. "Oh, he's competent, of course, and his fellow scientists are filled to overflowing with their respect of him, but he's not the kind of man I cotton to. I like straight talking men who tell you what they mean. With Allen, there's a lot of times when I wonder what he is talking about. The two of us don't talk the same kind of language."

"Barring all this," said Hammond, "cutting through all the lingo and the double-talk, what does he think?"

"He's puzzled," said the President. "A very puzzled scientist. I think he was convinced, when this first started, that the visitor was a machine and now he has to admit, at least to the probability, that it probably isn't. This pupping business has done violence to his little scientific mind. Really, I'm not too concerned with what he is thinking of it because he's going to change his mind a couple of more times before the week is at an end. What I'm more interested in is how the country's taking it."

"It's too soon to know," said Porter. "There are as yet no solid indications, no way to gauge reactions. There've been no outbreaks of any

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kind. Whatever may be happening is happening underneath the people's skins. They are still busy sorting it all out, holding in their feelings until they get it sorted out. But I have a hunch . . ."

He broke off his words and looked at Hammond and the secretary of state.

"Well, go ahead," said the President. "What is this hunch of yours?"

"It's probably silly. Or will sound silly."

"Well, go ahead and be silly. I hear a hell of a lot of silly things. I've listened to and profited from many of them. Anyhow, it's among us boys. John and Marcus won't mind. They've said their share of silly things."

"The hunch is this," said Porter, "and I'll not guarantee it, but I have the feeling that this pupping business, as you call it, may serve to somewhat endear the visitor to the people. This country goes all soft on motherhood."

"I don't know about that," said Marcus White, the secretary of state. "It scares me spitless. Not only do we have hundreds, perhaps thousands, of those creatures out in space, but the one that's here is spawning. What happens if they all come down and spawn?"

"The public won't think of that," said Porter. "Not now. Not right away. The spawning may give us a little time."

"Marcus," said the President, "I know you talked with the Russian. What did he have to say?"

"Not a great deal. Sounded as if he still was waiting for instructions from Moscow. Maybe Moscow doesn't know as yet quite what line it should take. Rumbled around a lot without getting anywhere. Gave some indication that his government might demand some hand in the study of this visitor of ours. I gave him no indication of what our policy might be. For starters, I told him we still considered it an internal matter. Personally, I still think we should give some thought to inviting foreign scientists to participate. It would make for better international relations and we probably wouldn't be hurt too much, if any."

"That's what you said the other day," the President told him. "Since that time, I've given considerable thought to your suggestion. I'm inclined to be against it."

"What Ivan is afraid of is that we'll find out something from the visitor that will give us a defensive edge," said Hammond. "That's why the ambassador did his rumbling about being counted in. My feeling is that we should hold up until we at least have some inkling of what we might have."

"I talked with Mike at the U.N. just before you all came in," said the President. "He tells me we'll have a fight to keep the U.N. from declaring this an international situation. All our little brothers in Africa and Asia and some of our good friends in South America think, or at least are saying, that this is something that extends beyond national interest. The arrival

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of a visitor from space, they argue, is of international concern."

"Well," said Hammond, "we can fight them off for a while. There isn't much that they can do beyond attempting to amass worldwide opinion. They can pass resolutions in principle until they are purple in the face, but there's not much they can do to implement the resolutions."

"We'll hold the line for a time," said the President. "If some others of the visitors drop in on us, that may be a different matter."

"You are saying, Mr. President," asked White, "that you'll not even consider my suggestion of a cooperative international study?"

"For the time," said the President. "Only for the time. We'll have to think about it and await further developments. The subject is not closed."

"What's vital for us to learn," said Hammond, "is the intention of these things. What is their purpose? Why are they here? What do they expect? Are they a band of roving nomads looking to pick up whatever's loose or are they a legitimate expedition out on an exploration flight? Do they represent a contact with some other civilization out in space or are they a pack of freebooters? How we react, what we do, must depend to a large extent on who and what they are."

"That might take a lot of finding out," said Porter.

"We'll have to try," said Hammond. "I don't know how it can be done, but we'll have to try. Allen's boys, in the next few days may start turning up a few facts that could be significant. All we need is a little time."

The intercom on the desk purred and the President picked up the phone. He listened for a moment and then said, "Put him on." Again he listened, a frown growing on his face. "Thank you," he finally said. "Please keep in close touch with me."

He put down the phone and looked from one to the other of them.

"We may just have run out of time," he said. "That was Crowell at NASA. He's had word from the station. There seems to be some indication that the swarm in orbit is beginning to break up."

19. LONE PINE

"They're cute," said Kathy.

"I can't see anything cute in them," said Chet. "They're just little black oblong boxes scampering around."

Scampering they were, hastening from bale to bale, ingesting each bale in turn, doing it neatly and precisely, down to the last shred of cellulose. There was no scuffling or fighting among themselves for possession of a bale; they were well mannered. If one of them was working on a bale, another did not try to horn in, but found another bale. They had eaten a number of bales, but there were still plenty of bales left. The voracious youngsters had barely made a dent in them. A mile or more of bales was spread along the lane cut through the forest and the adult visitor, at the far

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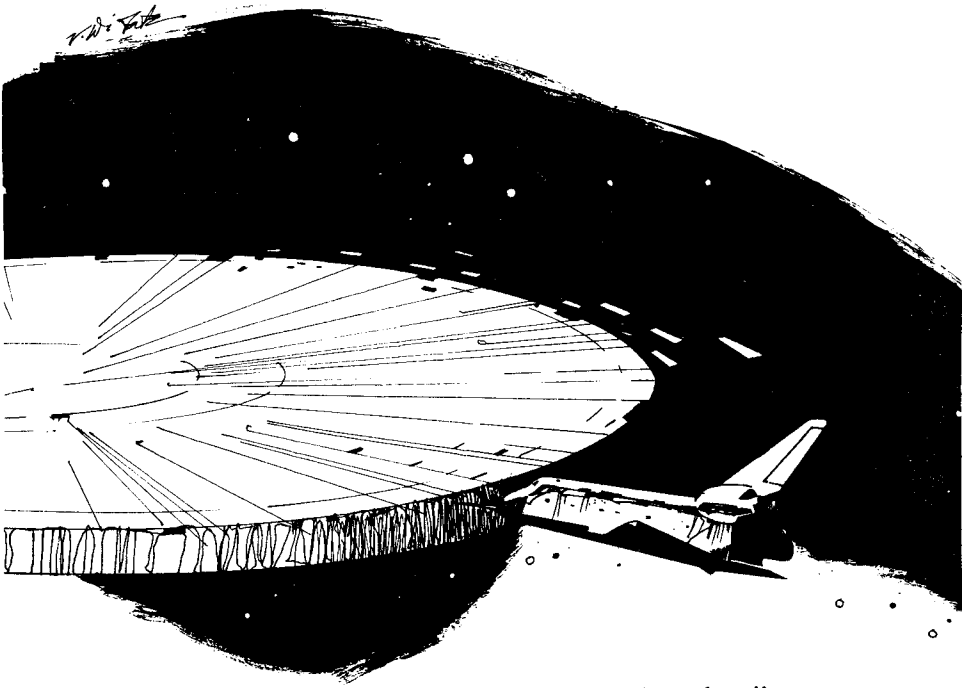

end of the swath, still was burrowing its way into the forest, regularly ejecting bales.

"It seems to me," said Kathy, "that they are growing. Would that be possible? They seem bigger than they were just an hour or so ago."

"I can't think so," said Chet. "They've been feeding for only a few hours."

"It seems to me, too, that they are growing," said Quinn, the New York *Times* man. "I suppose it could be possible. They may have an extremely efficient metabolic system. Much more efficient than any kind of life on Earth."

"If they are growing now," said Kathy, "it won't be more than a few more days before they can be cutting their own trees and extracting cellulose for themselves."

Norton said, "If that is the case, there goes the wilderness area."

"I suppose that somewhere along the line," said Quinn, "the forestry people will have to make up their minds what they want to do about it. This thing is our guest at the moment, I would think, but how long can we put up with a guest that eats everything in sight?"

"Or a guest that litters a brood of young on your living room floor," said Norton.

"The problem is," said Chet, "what can be done about it. You can't just shoo this thing out of the woods like you'd shoo a pig out of a potato patch."

"No matter what you say," said Kathy, "I think those little things are

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nice. They are in such a hurry and they are so hungry."

She tried again, as she had tried unsuccessfully before, to pick out the one she'd helped to regain its feet. But there seemed to be no way to distinguish one from the other. They were all alike.

And she remembered, too, that moment after she had helped the youngster to its feet and then had reached out to pat the mother. She could still feel, in the imagination of memory, the gentle twitching of the hide and then the hide folding over her hand in a soft embrace. I can't believe, she told herself fiercely, that there can be too much wrong with a creature of any sort at all that would respond like that—a gesture of recognition? a sign of gratitude for a service rendered? the friendliness of one life to another? or an apology for subjecting another intelligence to the trouble it had brought?

If only, she thought, she could put this in the story that in another couple of hours she'd phone into the *Tribune*. But there was no way that she could. If Johnny didn't throw it out to start with, the ogres on the copy desk would not let it pass. It would be an intrusion of the reporter into the story. It was something for which there would be no kind of proof, no documentation. How, Kathy asked herself, does one document a handshake with an alien?

Norton was asking Quinn, "Have you folks gotten anything out of the governmental observers?"

"Nothing much," said Quinn. "They've taken the visitor's temperature, or at least the temperature of its skin. They may have looked for a heartbeat, and I suspect they did, although they won't own up to it. They know it isn't metal, but they don't know what it is. It hasn't any treads or wheels to move on. It just floats along a few inches above the ground. As if it were disregarding the force of gravitation. One observer was speculating that it may know how to control and use gravity and his fellow observers probably will pin his ears back for his ill-considered muttering. And they know it is sending out signals. And that's about all they know."

"I'm not sure," said Chet, "they'll ever know much more. I wouldn't know where to start to find out any more."

"They have ways," said Quinn. "They'll learn other things but probably not all we need to know. We may be dealing here with something outside our knowledge. We may have to change some of our thinking before we understand it."

A silence fell—a relative silence. The growling and the crunching of the visitor in its chewing up of trees had stopped. Now the sounds that had been drowned out by the chomping of the trees came through—the chirps and calls of distant birds, the sound of the wind blowing through the pines, the chatter and gurgle of the river.

The newsmen and photographers who were in the cleared swath swung

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around to look. For a moment nothing happened. Maybe, Kathy told herself, it is only resting for a moment. But why, she wondered, should it be resting now? Since the time it had started on its strange harvest of the trees, it had not stopped to rest, but had continued to bore into the forest, lengthening the swath that it left behind it.

The visitor began to lift, so slowly that at first its movement was barely perceptible, then gathering speed. It rose above the pines and hung there for a moment—and there had not been any sound. There had been no roar of motors, no noise emitted by propulsive mechanisms. There was no flame, no smoke, no sign that any propulsive device had been used. It had simply floated up until it hung above the trees, hanging there as silently as it had risen. In the light of the westering sun, the green 101 that had been painted on its side stood out in sharp relief against its blackness.

So slowly that it seemed to be doing no more than drifting in the wind, it began to move eastward and upward. It built up speed and swung from the east to the south, its apparent size diminishing as it moved.

So it is going, Kathy thought; it is leaving us. It came and stayed a while. It processed food for its babies and now is on its way, its purpose filled, its function done.

She stood and watched until it was a small dot in the sky and finally the dot was gone. She brought herself back to the cleared swath in which she stood. And the place, she thought, somehow seemed lonelier, as if a valued friend had left.

The youngsters that it had left behind it still continued their scurrying about, feeding greedily on the bales of cellulose. One of the observers was busily painting numbers on them, but on them the paint was red, not green.

20. MINNEAPOLIS

It was after midnight before Johnny Garrison got away from his desk. Now, driving west on Highway 12, he tried to relax. Relaxation, came hard. There was nothing to worry about now, he told himself. The final edition was all wrapped up and Gold would stay on until the presses had started and he could have a look at one of the first copies from the pressroom. Gold was a good man; he could be depended upon to know what to do if something should come up. The chances were that nothing would occur. At the last moment before closing, it had been possible to squeeze out a few inches of space on page one to put in a bulletin carrying the NASA announcement that the new object in orbit appeared to be breaking up. As a matter of fact, the bulletin of the announcement was all that had appeared. There had been no official elaboration. When Garrison phoned the *Tribune's* news bureau in Washington, to catch Matthews standing the dog watch (a procedure that was followed only when big news possibly might be breaking), Matthews had been upset

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and slightly bitter.

"The bastards knew about it hours ago," he fumed. "I am sure they did, but they held the announcement up. Waiting for that sewing circle at the White House to figure out how it should be handled. They finally wound up letting NASA make the announcement, probably figuring it would have less impact than it would have coming from the White House. If you ask me, the White House doesn't know what to do. They're scared down to their toenails. I tried to reach Dave Porter, but he couldn't be found; neither could any of his staff. I imagine Dave is crisped to a cinder. He has spent the last two days assuring us that the White House would come clean on this one."

"What's the matter with them down there?" Garrison asked.

"It's too big for them to handle, Johnny. Too big and too different. They are afraid of making mistakes. I have a feeling that there is a hell of a squabble going on among the President's men, arguing what should be done, and not being able to get together on it. It's something entirely new, a situation that has never come up before and there is no precedent. It's not simple; not like the energy situation."

"The energy situation's not simple, either."

"Well, hell, Johnny, you know what I mean."

"Yes," said Garrison. "Yes, I guess I do."

The highway was relatively deserted; only occasional cars moving on it. A few of the eating places that dotted the road were still lighted, but the other places of business were dark, the gas stations faint glows with the single light in the office burning. Off to the north, the twinkling glimmer of street lights swaying in the wind marked a suburban housing development off the highway.

We did it right, Garrison told himself, running the events of the past two days across his mind. Getting Kathy and Chet up to Lone Pine shortly after the landing had been a move that paid off. Kathy had done well. There had been a time, he recalled, when he had considered sending Jay to replace her; now he was glad he hadn't. Jay might, in certain regards, have done a slightly better job, he thought, but not enough to justify the shattering of Kathy's confidence. An editor, he reminded himself, did not have the sole job of getting stories in the paper; it also was his job to build a staff.

And aside from that, he thought, we kept the news objective. We wrote it as we saw it, we played it responsibly. We shunned any hint of sensationalism—straight, responsible reporting all the way. And there had been times when it had been difficult to determine that fine line between sensationalism and responsibility.

The sky was clear. A large bright moon sailed halfway down the western sky. Here, beyond the glow of the inner city, the sky was speckled with a million stars. Cool, sharp air blew through the window at his left. He debated whether he would take the

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time for a good stiff drink before he went to bed. Jane would be awake, perhaps in bed, but still awake, waiting for the sound of the car coming up the driveway. She would be up and waiting for him when he came in the door. He went a little soft inside, thinking of all the years Jane had been up and waiting for him, no matter what the hour. The kids would be in bed and fast asleep and the house would have that strangely empty feeling with the clatter of their running stilled and it would be good to sit in the living room a while and have a drink with Jane.

Ahead of him the moon was blotted out. A cloud, he thought, staring through the windshield in amazement. A tingle went along his spine, for a cloud was wrong. A cloud would not have dropped from overhead and it would not have moved so quickly and even if it had, it would be fuzzy at the edges, not so black, so sharp, so regular. He took his foot off the accelerator, began gently braking. The darkness that had swallowed the moon was blacking out the stars that gleamed above the horizon straight ahead of him. The car rolled to a stop in the right hand lane. No more than a half a mile ahead of him the darkness that could not be a cloud, came down to sit upon the road.

He opened the door and stepped out to the pavement. Another car came up beside him and stopped. A woman thrust her head out of the right hand window and asked, in a shrill, excited voice, "What is going on? What's that up ahead?"

"I think it's another visitor," said Garrison. "Like the one up north."

"Oh, my god!" the woman shrilled. "Let's get out of here."

The man behind the wheel said. "Take it easy, Gladys. It may not be a visitor."

He got out of the car and joined Garrison, who had walked out ahead of the cars, standing in the glare of the headlights. He ranged himself alongside Garrison and stood staring at the thing that loomed on the road ahead.

"How sure are you," he asked.

"Not entirely," Garrison told him. "It looks like one. It popped into my mind it could be one of them."

"It's big," said the other man. "I read about the one up north and saw pictures of it. But I had no idea it could be that big."

It was big. It blocked both the traffic lanes and the grassy median that ran between them. It was black and rectangular and loomed high against the sky. Having settled, it did not move. It sat there, a lump of blackness.

The woman had gotten out of the car and came up to them. "Let's turn around and get out of here," she said. "I don't like it."

"Goddammit, Gladys," said the man, "quit your caterwauling. There's nothing to be afraid of. That one up north never hurt no one."

"It killed a man. That's what it did."

"After he shot at it. We ain't shooting at it. We're not going to bother it."

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It must be a visitor, Garrison told himself. It had the square blockiness that the photos had shown. It was exactly as Kathy had described the one at Lone Pine. Except for its size; he was not intellectually prepared for the sheer, overwhelming size of it.

Two other cars had come up behind them and stopped, the people in them getting out to walk up the road to where the three of them stood. Another car came along, but did not stop. It ran off the road, crossed the median, gained the eastward traffic lanes and went roaring off.

The NASA announcement had said that the object in orbit appeared to be breaking up. It was doing a hell of a lot more, Garrison told himself, than simply breaking up; the visitors that had clustered in the orbiting object were coming down to Earth. There was one here, spraddled across the road, and the likelihood was that it was not the only one that had come to Earth. There would be others, scattered all over the world. That first landing at Lone Pine probably had been no more than a test attempt at landing, a preliminary probing to have a look at the situation. The Lone Pine visitor, before it had spawned and then had taken off, had been sending signals to its fellows orbiting in space and now the invasion was on. If it could be called an invasion. Garrison reminded himself that probably it was not an invasion in the classical sense of the term. A reconnaissance in force—could that be what it was? Or simply a visit, intelligences of another world dropping in to say hello?

He started walking up the road toward the visitor. Looking back over his shoulder, he saw that only one of the others who had been standing with him was following. With only a quick glance at the follower, he could not be sure which one of them it was. Perhaps, he thought, he should slow down and let the other man catch up with him, but decided against it. He did not feel like engaging in the meaningless chitchat that would come from the other, filled with the questioning and wonder. Why do you think it landed here? What does it want? What kind of thing is it? Where do you think it's from?

He increased his stride, almost running down the pavement. When he came up to within a few yards of the huge blackness, he swung to his right, to the far shoulder of the highway, and began making his way around it. There was no question in his mind that it was a visitor—a huge black oblong box with no gadgets attached to it, with no external features at all. It sat there. It did not move. It did not click nor purr. Going up to it, he laid his hand, spread wide, against its hide. The hide was hard, but not with the hardness of metal. It was warm, with a warmth that somehow had the feel of life. Like touching a man, he thought. Like stroking a dog or cat. A soft warmness, despite the hardness of the skin, that spoke of life.

Standing there, with his spread out hand against the warmness of the

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hide, a sudden chill ran through him, a chill that set his teeth on edge and made his face feel, for a moment, stiff and hard, as if it might be changing into stone. And, even as he felt the chill, his suddenly racing brain launched into a frantic scurry to analyze the chill. Not fear, said the analysis, not terror, not panic, no inclination to burst out screaming, no urge to run, no buckling of the knees—only that terrible coldness which was not the coldness of the body only, but a coldness of the mind, and a coldness of the mind that the mind could not understand.

Slowly he pulled his hand away from the hide and there was no need to pull it, for nothing held it there.

He let his arm drop to his side, but, otherwise, he made no movement and he let the chill ebb out of him, not going quickly, but draining slowly from him until it was gone, although the memory of how it had been stayed with him.

A touch of strange, he thought, but more than a touch of strange. Rather a brush against something that he could not understand, that no human might be able to understand. A touch that was composed of the coldness and the vastness of deep space, of the flare of distant suns, of dark planets that were unlike the Earth, and the incomprehensibility of a life that had been spawned in the darkness of those planets. As if he had been hurled into a place that he did not know and perhaps could never know, that he could not even begin to know no matter how long a time he spent there. Incomprehensibility, that was it, he thought.

And, yet, the damn thing looked so ordinary, was so unspectacular, an almost old shoe structure.

He backed away from it, staring up at the great black wall of it that rose so high above him. And the hell of it was, he found, that he wanted once again to step close to it and lay his hand against it so that he again could feel the warmness of it, and perhaps the chill as well.

But he did not step closer to it, did not lay his hand against it. He backed a few steps away from it, then turned around and hurried back the way that he had come. Not running, for he sensed there was no reason he should run, but taking long, deliberate steps to get away from it as quickly as he could.

Out on the highway and clear of the visitor, he saw that several other cars had stopped and the cluster of people standing in the road had grown. He did not see the man who had followed him. Even had he seen him, he would not have recognized him, for he had caught only that one, quick over-the-shoulder glimpse of him.

One man stepped out of the cluster to intercept him as he came down the road. "What did you see?" the man asked. "Is there anything going on?"

"Why don't you go and look?" Garrison asked him brusquely, brushing swiftly past him.

It was strange, Garrison thought, that there was so little panic. If there

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was fear, it was being hidden. What was it about the visitors that seemed to inspire no fear? Maybe it was because it was so totally unlike the common concept of something out of space. To a people brought up on the idiocies of TV and movie imaginations, the reality must seem quite commonplace.

His car was standing with the headlights burning and the engine running. He got into it, pulled up the road a car length or so, than cut to his left, drove across the median to reach the eastbound lanes. A mile down the road he pulled into a flanking service lane to reach to a roadside phone booth.

Gold answered, his voice slightly flustered, on the second ring.

"I am glad you called," he said. "I was tempted to call you, but hesitated, because I thought you'd be asleep."

"Why should you be calling me?"

"Well, another visitor has landed. Right in our lap this time. It's sitting on one of the runways at the airport."

"That's only half of it," said Garrison. "There's a second one. Came down on Highway 12, about a mile east of Ridgedale shopping center. It's blocking off the road."

"You there now?"

"That's right. It landed half a mile or so ahead of me. I better come on in. These may not be the only landings in the area. You have someone you can send out to keep an eye on this one?"

"I don't know. I'll look around. Jay was still here, so I sent him to the airport. Have a photographer out there as well."

"What's happening at the airport?"

"Not much, so far. The visitor is roosting out there, not bothering anyone, but the men in the tower are up tight. Not much air traffic out there now, but it'll pick up in a few hours. The visitor being there means there's one less runway to handle the planes."

"Anything on the wires? Any other landings in other places?"

"Fragmentary reports. Nothing solid. Nothing confirmed. Someone in Texas phoned the police to report one down. Another report from New Jersey. Simple reports of sightings, nothing official yet."

"I'm afraid the swarm that was in orbit out there is beginning to come down."

"Look, Johnny, why the hell don't you go on home, get some rest. There must be ways to bypass the visitor blocking the road. It'll be twenty hours before we can go to press again."

"No. If need be, I can go down to medical service and stretch out on a cot, get a few hours sleep later on. Any word from Kathy?"

"None. Why would you expect her to be calling? She's probably been asleep for hours."

"I think when she does phone, we should call her in. The Lone Pine thing is finished. The action will be down here so far as we are concerned. Anything happen at Lone Pine, Norton can fill us in. We need Kathy. She's the one who knows about these things."

"O.K. I'll tell her if she calls."

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"I'll see you in a while," said Garrison.

He hung up, fished in his pocket for another dime, inserted it in the slot and dialed.

Jane answered. "Johnny, I'm sitting up, waiting for you. When will you be home?"

"I started out," he said, "then something happened."

"And you aren't coming?"

"Not for a while. One of the visitors landed on the road just ahead of me. I have to get back to the office. Jim tells me another one landed at the airport."

"You mean one landed on Highway 12?"

"That's right. Just east of Ridgedale."

"Johnny, that's only four or five miles from here."

"Yes, I know," he said. "But there's nothing..."

"Johnny," she said, "that's too close. I'm getting scared."

21. THE UNITED STATES

They came down through the night, like homing birds, although they were not homing birds, but were settling on a terrain that was alien to them. They came seeking through the dark, although it was not dark to them, and picked out their landing places with a certain care. There was little interference, for there was nothing, at this time of night, to interfere with them. They kept in touch with one another, talking back and forth and there was nothing that one sensed the others did not know.

They landed in the watery delta lands where the Mississippi flowed into the Gulf, on the broad plains of Texas, the deserts of the American Southwest, the sandy beaches of Florida, the wheatlands of the West, the rustling cornfields of the Central States, the commons of New England villages, in southern cotton fields and sweet potato patches, on the concrete of large airports, astride the great highways that spanned the continent, along the western seaboard, in the forests of Oregon, Washington and Maine, in the woodlots of Ohio and Indiana.

They came down and landed silently with no more noise than the whisper of the air disturbed by their passage. They landed softly, then rose an inch or two from where they had landed and floated just above the surface. They disturbed few of the sleeping millions they passed over and landed among. Only on occasion were they sighted and, except when they landed on airports or highways, that by accident.

They made a flurry of soft, fluttering, mothlike tracks across the screen in the war room of the Strategic Air Command, but there the watchers of the screens, maintaining an intent, militarily professional surveillance, had been warned and were prepared for them, their only real concern being that the coming of the visitors cluttered up the board and might mask other kinds of incoming objects.

In those instances where they landed in forested areas, they almost immediately set to work harvesting

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cellulose. In a suburban Virginia housing tract, not far from Washington, one of them, in lieu of trees, began the harvesting of houses. Another, in Oregon, landed adjacent to a huge lumber yard and began the chomping of stacked lumber. But the most of them, coming to rest in less productive areas, simply squatted down and waited.

22. MINNEAPOLIS

Gold was on the phone when Garrison came into the newsroom. The only other people in the room were three copyreaders and two sleepy dogtrick copy aides.

Gold hung up the phone and said to Garrison, "That was some screwball, calling to tell me that a group that calls themselves the Lovers are going to go out to the airport, sit down in front of the visitor there and love it all to hell. Isn't that the silly bunch that Kathy wrote about?"

"That's right. Did Kathy's story ever make the paper?"

"I never saw it. Just knew you sent her out on it."

"It's probably still in her typewriter. She was working on it when I interrupted her to ship her off to Lone Pine. Now that I am here, why don't you take off?"

"Not on your life," said Gold. "I wouldn't miss this for a million dollars."

"All right, then, if that's the way you feel, why don't we settle down and figure what we should be doing. Probably, in the next few hours, we should start calling in some of our people early. You have any ideas?"

"Jay's out at the airport now," said Gold. "I caught Sloane before he left and sent him out to Highway 12. Jones just got back from South Dakota and he'll have to write his Black Hills-Indian story for the Sunday paper."

"Let's forget the Black Hills piece," said Garrison. "We'll have plenty else and it can wait. Jones is a good man and we'll need him. He's had a good night's sleep. Call him in another hour or two."

"Freeman is another man we could use early," said Gold, "he knows his way around the statehouse. The governor, most likely, will be calling out the guard. We need someone who can sit here at a desk and keep tabs on what the state is doing. I phoned the highway patrol and it is on the job. They'll probably have troopers three deep around the visitor on Highway 12. Some at the airport, too, but the airport has its own security force and may not need much help."

"They'll have real problems out there when the traffic picks up later in the morning."

"They have problems now. It puts a crimp in handling air traffic when you have a runway out."

"Why the hell do you think that thing landed at the airport?"

Gold shook his head. "For that matter, why should one land on a highway? Why do they land in any one particular place?" He reached out his hand and picked up a sheaf of paper

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ripped off the teletypes. "All over the country," he said. "Mostly reports of sightings, but some of them now are being verified. One reported here, another there. Reports from truck drivers, late people driving home from work, night watchmen, from all kinds of night owls."

"Like us," said Garrison.

"That's right. Like us."

"We'll need coverage of state and federal agencies," said Garrison. "Anyone or any agency that can be possibly involved. Williams is our man to contact the local FBI. No one is going to get much out of the FBI, but Williams will come closer than any other man. He seems to get along with them."

"Campbell, maybe, could tackle some of the people at the university," said Gold. "Physicists, psychologists, engineers, aeronautic people. They might be able to give some insight on what is going on. Maybe some of the sociologists and psychologists may be able to make some sort of an assessment on what the public impact will be. And we can't forget the churches. Will this business have any impact on religious thinking?"

"We'll have to pick our sources carefully," said Garrison. "Some of these churchmen are inclined to shoot off their mouths in all directions and endlessly and without thought on any given subject."

"Roberts might be the man for that," said Gold.

The phone rang and Garrison picked it up.

Kathy's voice asked, "Is that you, Johnny? What are you doing there this time of night?"

"We have some of your visitors down here. How about yourself? We talked about phoning you, but figured you were asleep."

"I was, but Stiffy came pounding at the door and woke me up."

"Stiffy?"

"That old man who took the call and held the phone for me."

"Now I remember. Why should he be pounding at your door?"

"He was sleeping off a drunk and woke up and saw them."

"Them?"

"More of the visitors. A dozen or so of them, all coming in a bunch. They landed across the river, in the wilderness area. They're lined up abreast, mowing down the trees and turning out cellulose."

"But Stiffy . . ."

"I gave him five dollars for holding the phone. Chet gave him a quart of booze. We've bought the man for life."

"We need you and Chet down here, Kathy. I think there's an early morning plane out of Bemidji. Can you manage it?"

"it doesn't leave until six or so. Plenty of time. Even time to go out and have a closer look at these new visitors. Stiffy's pounding Chet awake right now."

"Okay. Whatever you can manage. But don't miss that plane. All hell is set to let loose down here."

"I should give Stiffy another five."

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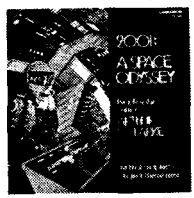

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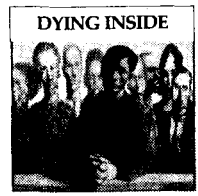

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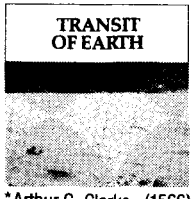

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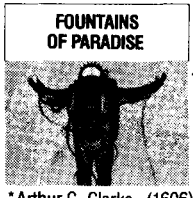

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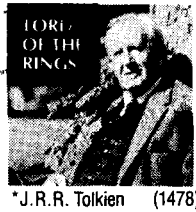

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"Give him ten," said Garrison. "Norton can keep an eye on things up there for us and Stiffy maybe can do some legwork for him."

23. THE UNITED STATES

People woke and turned on their radios to learn what kind of weather they might expect that day. There was no weather news; instead a running commentary, half news, half wonder and speculation spewed out of the sets.

The people listened, prickled by the first faint touch of fear. The Minnesota visitor had been a novelty, an event that brought twinges of excitement and well-hidden apprehension, but there had been only one of them. It had stayed for a time and then had flown off and, except for the young that it had spawned, that had been the end of it. But now, suddenly, a horde of the things had descended on the Earth. Well-behaved, of course, not really causing trouble, but posing an uneasy wonder as to what kind of things they were, what they might expect of Earth.

The people went about their work, but all day long they met other people who were prone to stop and talk about the wonder of the visitors. Throughout the day, the uneasiness kept growing as rumor piled on rumor, as speculation grew, adding to the sense of uneasiness and, at times, the sense of fear. Little work was done.

An Iowa farmer, not bothering to turn on his radio, went out in the early dawn to do the morning chores and was stopped in his tracks by the sight of the huge black box that was sitting in his cornfield. He hurried back into the house and came out again armed with a twelve-gauge shotgun, his jacket pocket sagging with a handful of shells. Riding a small farm tractor, he went to the cornfield and parked outside the fence that enclosed the field. Climbing from the tractor, he crawled through the fence and walked toward the visitor. It made no sign that it noticed his approach. Cautiously, he made his way around it. Apparently, it was doing nothing; it was only sitting there. Twice he raised the gun, his finger on the trigger; each time he decided not to shoot. There was no way of telling, he reminded himself, what it might do if he shot at it. Finally, having circled it, he climbed through the fence, clambered on the tractor and went back to the morning chores.

Looking to his left, the airliner pilot spotted the visitor several miles away. He reached out a hand and nudged the man sitting next to him. "Look over there," he said. The other looked. "It's paralleling us," he said. "I thought all of them were down," the pilot said. "Sitting on the ground." They continued to watch it. It continued on course with them, matching their speed, moving no nearer or no farther off.

A man stood on a street corner in a ghetto area and raised his arms above his head. He bellowed to the others in the street. "Our brothers out of space," he howled, "have come to

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rescue us. They're dropping down to confront those who hold us in our bondage. Let us rejoice, brothers, for help has finally come." The people gathered to listen to his mad ranting, grinning or scowling as the words might strike them, but not believing him, for these people of the street believed no one at all, but sensing in him a primitive excitement that stirred in them a savage anger at their hopelessness. And hour later, there was looting and burning in the area.

In one New England village, someone (never identified) went into a church and began ringing the bell. Curious people came to learn why the bell was ringing. And to many of them, it seemed good to be there, proper to be there when visitors had come upon the Earth. So they went into the church and the minister, hurrying from the parsonage, found them there. To him, as well, it seemed proper that they should be there, so he led them in prayer. In other villages, other church bells rang and other people came to be led in prayer. Across the land suddenly god-stricken people flocked to church.

National guardsmen cordoned off the visitors that were sitting on the ground. Highway patrolmen worked to keep traffic moving as thousands of sightseers converged upon the sites where the visitors were sitting. And in some scattered places visitors, floating easily along, only a few hundred feet above the ground, patrolled the highways. Motorists stopped their cars to get out and gape and tangled traffic jams resulted. There were many accidents.

24. WASHINGTON, D.C.

Winston Mallory, the secretary of defense, said to the President, "Whiteside thinks we should run a test of how these things react to firepower. Under the circumstances, I recommend that we should turn him loose. It didn't make much sense when there was only one of them, but now that they've invaded..."

"I object to your use of the term invasion for what is happening," said the secretary of state. "A fair number of them have landed, but there has been no violence. They're not killing our citizens, they're not burning our cities."

William Sullivan, secretary of interior, said, "They chewed up a housing development across the Potomac. One of them gobbled up a lumberyard out on the west coast. They're eating our forests in Michigan, in Maine, in Minnesota, in Washington and Oregon."

"But they haven't killed anyone," said State. "The only thing they've done is steal a little cellulose. They haven't..."

"Just a minute, Marcus," said the President. "I want to hear more about this weapons test. What does Whiteside propose to do? Open up on them with tanks?"

"Nothing like that," said Mallory. "Just a simple test, that is all. We've got to know how these things respond. You remember, out in Minnesota, a man fired at the one that landed there

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and it fired back, killing him. He used a deer rifle, probably a .30 caliber. The thing about it is that we don't know what happened, how the visitor did it. It carried no apparent weaponry. It was bare of any external features. Yet when that man fired at it..."

"What you want to do is fire another .30 caliber, probably by remote control, then try to determine how the visitor fires back?"

"Precisely. We'll use cameras. High speed cameras. Some of them can take up to thousands of frames a second. That way we can track the bullet, record the moment of impact, see what happens on impact. A study of the film..."

"Yes, I see," said the President. "If you can be sure the general will stop with a .30 caliber."

"He will stop at the .30 caliber. All we want, all he wants, is some idea of how the visitor shoots back. Once we know that, we can go on from there."

"If it seems necessary."

"That's right. If it seems necessary."

"And, for Christ's sake, tell Henry to go easy. Take all possible precautions. Exercise all restraint. Only the one shot to get the data."

"He'll go easy. I have talked with him about it."

"I'm impressed by what Marcus was saying," said the President. "Except for this cellulose business, nothing actually has happened. The closest to anything disastrous was the Virginia housing development..."

"People could have been killed," said Sullivan. "It was just plain dumb luck that everyone got out of the houses in time. There were people sleeping in those houses. A lot of them could have lost their lives. And they're sitting down at airports, closing runways. Let one plane crash because of that and we'd have casualties. Also, I understand they are flying along with planes, as if they might be studying them. So far nothing's happened, but it could."

"What would you have us do?" asked State. "Wheel out our artillery?"

"No, of course not. But we should be doing something. We shouldn't just be sitting here."

"We've called out the National Guard," said the President. "Troops are keeping each of our visitors isolated, keeping the public away from them. That way we probably will avoid incidents."

"What if our visitors start in on other housing developments?" asked Sullivan. "What if they move into the residential areas of our cities, leveling houses to get cellulose? What will we do then? How will we take care of the people who will be homeless?"

"They haven't done that yet," said Marcus White. "Virginia apparently was an isolated example. And the visitor stopped after chewing up a few houses, as if it realized it had made a mistake."

"We have to take care of emergencies as they arise," said the President. "Meanwhile, we'll have to do everything we possibly can to find out more

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about our visitors."

"The thing that puzzles me," said White, "is that so far they've landed only in the United States, with some small slop-over into Canada. None in Europe. None in Africa. None anywhere else. Why us? Why just us?"

"I think I may have a suggestion," said Dr. Steven Allen, the science advisor. "Let's put ourselves in the place of the visitors. Let's say we have sent out an expedition to some other planet. A half a dozen ships, a hundred—the number's not important. We are looking for one specific thing, like these things apparently are looking for cellulose. We don't know too much about this planet we have reached. A few things by instrument study from some distance off, but that is all. So we send one ship down to study the situation. There are several land masses and we pick one as a starter. The ship goes down and finds what we are looking for. It finds, as well, that the indigenous life in that area seems friendly. At first glance, there's nothing on that particular land mass that is about to cause too much trouble and we, of course, want as little trouble as possible. We know this one land mass is safe; we don't know about the others..."

"You make a good point there," said the President. "Don't you agree, Marcus?"

"Yes, I do agree. I hadn't thought of it in quite that way. I had assumed the visitors might want a rather broad look at the entire planet."

"Have you anything else for us?" the President asked the science advisor.

"A big puzzle," said Allen. "Much as we hate to even think it, there seems to be a fair possibility that the visitors operate by means of some sort of gravitational control. They float an inch or two above ground level. The one that left Minnesota yesterday rose into the air with no sign of using any propulsive units. They come down to land slowly, almost as if they were gliding to a landing, but to glide you have to make use of wing surfaces and they haven't any wings."

"You sound just slightly outraged over it," said Defense.

"I am outraged," Allen told him. "Any scientist would be outraged. We talk about gravity waves, the implication being that they would somehow be akin to electromagnetic waves. And we've looked for them. For a long time, no one could even figure out how to look for them. We're not even sure, right now, that we are using correct methods in our attempt to detect them. So far, none has been detected. At one time many scientists said, and some still say, that there aren't such things as gravity waves. As things stand now, even were we able to detect them, it would be only on a theoretical basis. No one has even the slightest idea of how they might be put to work."

"Your men are still hard at work on the visitors, I suppose," said Defense. "There still is hope that you will be coming up with something. After all, it's been only a couple of days."

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"Not only our own men," said Allen, "but every qualified worker I can lure into the study. I've contacted a number of universities and institutes. In a few days, we'll have a large force in the field. The trouble is that we haven't much to work with. All we can do is observe. Stand off to one side and look at them. If we could trap one of them somehow so we could really work on it, we might find something of significance. But, at the moment, that is unthinkable. It probably would be highly dangerous. There has been a suggestion that we try to work on some of the young the Minnesota visitors spawned. But I shy away from that. If the baby started squalling that it was being hurt, adult visitors probably would come in force to its rescue. I can't be sure of this, but I hate to take a chance."

"You say universities and institutes," said White. "In this country only, I assume. Might there not be some scientists from other countries..."

"Marcus," said the President, sharply, "let's not get into that again. For the moment, this is our show. The visitors have helped to keep it our show by landing here exclusively."

"There are a few in Canada," said White.

"We can work with Canada. We've always been able to. I know the Russians want in, but I'm opposed..."

"A small, token Russian representation might not be a bad thing," said Defense. "If we push them too far, if we shut them out..."

"I hope, Winston," said the President, "that you're not thinking what I'm afraid you are."

"The thought had flitted across my mind," said Mallory. "If it seems we are finding something that could tip the balance..."

"And if we did find something to tip the balance, as you say, and shared it with them, that would only mean further escalation. How many others feel the same way?"

"I didn't say share," said Mallory. "I said a token inclusion. That is all. Something to save their national pride."

"I think with Winston," said White, "that we can afford to do something to make these friends of ours look a little better."

Hammond, who until now had been sitting silently, spoke up, "What you're talking about is patronizing them. They'd sense that and resent it. It would be worse than nothing. They can understand nothing because that's what they'd give us if the situation were reversed. We either go whole hog with them or keep it for ourselves. One thing we must realize is that there may be nothing to share. With all due respect to Dr. Allen, we may not find out one damn thing that will be useful to us."

"In which case," said White, "there would be no harm in letting them in. It would improve relationships greatly and if we found nothing, it would cost us nothing."

"Marcus," said the President, "you are talking about playing the

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odds and that could be dangerous."

"Let's forget it," said Mallory. "I'm sorry I mentioned it. It just came off the top of my head."

"The embarrassing thing about all this," said White, "is that we are receiving offers of assistance from good allies and friends to help us in any way they can. They seem to be sincere..."

"I just bet they are," said Hammond.

"The only thing I can tell them," said White, ignoring Hammond, "is that later on we may call on them, but that, at the moment, we don't know what we face."

"I think, for the moment," said the President, "we had best leave it at that. Let's forget other countries for the moment and look to our own. There have been a few minor flareups. Small riots, some looting and burning in such places as Chicago, New York, St. Louis. Is there anything new on all of this, Dave?"

"Nothing big," said Porter. "And in this we have been lucky. We should have prepared the country. We should have called in the press when we first found the swarm was beginning to break up. We could have forewarned the country."

"You're still smarting over that?"

"You're damned right I am, Mr. President. We botched it. To let NASA issue that skimpy little announcement was a sneaky thing to do."

"Dave, we talked it over."

"Yes, I know. And you were wrong," Porter said firmly.

"You went along with it."

"I didn't go along. I protested and there were a few who sided with me."

"But only a few."

"Sir, you can't run a news operation on a majority vote. The rest of you know your business, but I know mine. Right now we've been lucky. I hope we can say the same thing at this time tomorrow. The thing I'm afraid of is the cult outbreak. Every crackpot in the country is up on the stump and shouting. All the evangelists are calling big prayer meetings. Every little backwoods church is filled with clapping, stomping, singing people. Out in Minneapolis, a group of second generation flower people tried to rush police lines. They wanted to squat down on an airport runway and give the visitor that landed there a demonstration of their love."

"I don't think we need to worry too much about things like that," said Hammond.

"There's a lot of emotion boiling around," Porter told him, "a lot of it still beneath the surface. I hope it can be kept from boiling over. Mixed emotions of all sorts. Latent fears that can easily boil up to the surface. Hallelujah emotions that can get out of hand. We're on the edge of something that could produce violent street encounters. Let a bunch of beer drinking hardhats get fed up with the antics of the millenium-has-come dancers in the streets..."

"I think you're exaggerating," said Hammond.

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"I hope I am," said Porter.

"I don't like this watchful waiting," said Sullivan. "I think we should act in some positive manner. Something to let the people know we are involved, that we, at least, are taking some action."

"We've called out the National Guard," said the President. "We have investigators in the field."

"That's passive action," said Sullivan.

"The trouble is," said the President, "that anything we did probably would be wrong."

25. THE UNIVERSITY OF MINNESOTA

Dr. Albert Barr said to Jerry Conklin, "Miss Foster phoned to say that you wanted to talk with me, but she wasn't too specific. She indicated it had something to do with the visitors." He said to Kathy, "You assured me this is not an interview for an article in your paper."

"It's not an interview," said Kathy, "and I was not specific because I think that Jerry should tell you what happened."

"I've been worried about it," said Jerry, "ever since it happened..."

"Please tell me what happened," said Barr. "Start at the beginning."

He lounged behind his desk, regarding his two callers with a quizzical expression. He was a sandy-haired man, much younger than Kathy had expected him to be, with the build of a football player. Through the open window of his office came the sounds of a late afternoon on campus, the shrill laughter of a girl, students shouting back and forth, the deep humming of a started car and the scream of tires on pavement as it was gunned to a sudden take-off. Golden spangles of light flecked the windows as the westering sun shone through a birch tree decked in bright autumnal color.

"You may have read about the car that was smashed when the first visitor landed at Lone Pine," said Jerry.

"Could it have been your car?" asked Barr.

"It could have been. It was. I had parked at the end of the bridge to get in some fishing. I had been told there were some big rainbow in the pool below the bridge."

Barr did not interrupt as Jerry told his story. A couple of times he seemed to be on the verge of asking questions, but he did not ask them.

When Jerry had finished, the exobiologist said, "There are a number of points I would like to raise and discuss with you, but tell me first, why have you come to me? What do you want of me?"

"There are two things," said Jerry. "This business of home. The visitor thought of home, or made me think of home. I've mulled it over and over and there seems to be no sense to it. I am convinced that it induced the thought I had of home. In a situation such as that, I would not have thought of home. And the thought was real enough—not just a brief impression, but something that continued. As if

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the visitor or whatever was inside the visitor wanted me to think of home, kept on pressuring me to think of home."

"Are you trying to say that telepathy was involved?"

"I don't know what was involved. If by telepathy you mean that it was talking with me, or trying to talk with me, no, that was not the case. I tried to talk with it, which might have been a foolish thing to do, but something, that under the circumstances, I imagine might have come quite naturally. There I was, trapped in a place that I did not understand and I was reaching out for information, for any kind of information that would help to explain what was going on. So I tried to talk with it, to establish any kind of contact, to seek some answers. Probably I was fairly well aware that it would be impossible to establish contact, but..."

"Do you consider yourself in any way telepathic?"

"No, I do not. I have no telepathic ability that I am aware of. The simple fact is that it is something I had never thought about. I would say I'm not a telepath."

"And yet it talked to you. Or you think it talked to you."

"Dr. Barr, that's not what I said," said Jerry. "At no time did I think the visitor was talking to me. No conscious communication, no words forming in my mind, no pictures, nothing like that at all. There was just this feeling of home, this overpowering sense of home."

"You are convinced the feeling came for the creature?"

"Where else could it have come from? I am convinced the thought of home would not have occurred independently to me. There was no reason for it to. There were a lot of other things that were more important for me to think about."

"You said two things. What was the other thing?"

"It seemed to me," said Jerry, "that the visitor was a tree or very like a tree."

"You mean after you learned about the cellulose?"

"No. I'm convinced the cellulose had nothing to do with it. I don't think that was the case. I imagine there must have been some underlying question of what it was and there seemed to be some familiarity and..."

"You're in graduate work in forestry. You must know a lot about trees."

"He's in love with trees," said Kathy. "Sometimes I get the impression that he talks with them."

"She's exaggerating," Jerry told Barr. "But, yes, I do know a fair amount about them and I guess I could say I have a fair degree of empathy with them. There are people who are gone on animals, those who are flower enthusiasts, devoted bird watchers. Maybe you could say I'm a tree watcher."

"You used the word 'familiarity' back there a ways. What made you use that word?"

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"Perhaps because I think I could have felt some familiarity with it, not being aware of it at the time. To start with, when I found myself inside it, I was frightened—deep-down, deadly, screaming frightened, although I didn't scream. But in a little time, a far shorter time than one would think, I wasn't frightened, at least not frightened in that way. I got all tense and cold, but I wasn't garden-variety scared any longer. I was even getting interested before it threw me out."

Barr said, "You must realize that an exobiologist is a strange sort of animal. Really, there is no such thing. Rather, they are men in other disciplines, mostly the biological field, although physics and chemistry also could enter into the picture, who because of personal interest have branched out into a study of what might be expected under extraterrestrial conditions. So you understand, of course, that there is no real, precise science of exobiology."

"Yes, of course," said Jerry. "But at least the exobiologist would be thinking about what might be found in space and on other planets."

"So, with such a disclaimer duly noted," said Barr, "I must agree that your idea of an intelligent treelike organism need not be too far off the mark. In the last twenty years or so, there have been botanists who have contended that on occasion plant life may show some capacity for sentience, possessing powers of sense or sense perception, experiencing sensations and feeling. For years, we have known that certain people seem to have green thumbs, under their care plants will flourish while under the care of others who do not have this capability, they fade and die. There are those who advocate that plant owners talk sympathetically to their plants. If plants, in fact, do have such sensitivity, then it is only a couple of long steps until we arrive at a true intelligence and full sentience. Could you explain a little more fully how you arrived at the realization the visitors could be plantlike, akin to trees?"

"I'm not sure I can," said Jerry. "I get a certain feeling when I look at a tree, or when I work with trees. A sort of kinship to them, which may sound strange . . ."

"And you think you may have felt the same kinship to the visitor?"

"No, not kinship. The visitor was too alien to feel anything like kinship. Perhaps a realization that some of the qualities I feel in trees were also in the visitor. But skewed around. Not like a tree of Earth, but a tree of somewhere else."

"I think I understand," said Barr. "Have you told anyone else of this?"

"No. Someone else would have laughed at me. You didn't and I thank you for that."

"The government would like to know. The federal observers and other scientists who are investigating the visitors would be grateful for any kind of data."

"I have no data," said Jerry. "Lacking data, they would try to dig it out of me, feeling that I must have

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some hidden information that I might not be aware of. Either that or they would think I was another UFO crackpot trying to cash in on the visitors."

"I see your point," said Barr. "If I were in your place, I would have the same reservation."

"You sound as if you believe me."

"Why not? Why should I have reason to disbelieve you? There is no reason in the world you should have made up such a story. You felt a need to tell someone who might just possibly understand and take what you have to say at face value. I'm glad you came to me. I haven't been much help, but I'm glad you came. And on this business of thinking about home...I've been thinking. Could it be possible you misinterpreted what was going on?"

"I know there was a powerful compulsion to think of home."

"I don't mean that. Maybe the visitor was not talking to you at all, not trying to convey anything at all. You might have cued in on its thoughts. You may be just a little telepathic, whether you know it or not, or the signal, the emotions of the visitor might have been so strong that no human could have avoided reacting to it. The thought comes to me that it may not have been broadcasting any thought of your home, but of its home."

Kathy gulped. "You mean here, the Earth? That it was thinking of Earth as home?"

"Consider this," said Barr. "It had come from God knows where, over no one can imagine how great a distance, looking for a planet where it could settle down, looking for a new home to replace the one that somehow had been lost. Maybe the Earth is that kind of planet—where it could bud and reproduce its young, find food for them, live the sort of life it perhaps had despaired of ever living again. Saying to itself, 'Home! Home! I've finally found a home!'"

26. THE UNITED STATES

The visitors observed. Some of them having set down, stayed where they were. Others, after a time, floated into the air and set about their observations. They cruised back and forth over industrial plants, they circled and re-circled cities, they made sweeps of vast stretches of farmland. They escorted planes, maintaining their distance and position, never interfering; they flew up and down long stretches of highways, selecting those areas where the traffic flowed the heaviest; they followed the winding courses of rivers, keeping watch of the boats and other craft that plied the watercourses.

Others of them sought out forests and settled down to eat. They gobbled up a number of lumberyards. In the St. Louis area, three of them landed in a used car parking lot, ingested a dozen or so cars, then took off. But aside from ingesting trees and the cars and gulping down forty or fifty lumberyards, they did little harm. Most people with whom they came in contact were only marginally inconvenienced; no one was killed. Pilots

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flying planes became jumpy at being shadowed by the visitors. The highway accidents, few of them more than fender benders, fell off as motorists became accustomed to the sight of the great black boxes floating up and down the highways, coming at last to pay but slight attention to them.

The visitors qualified as first class nuisances. They tied up the National Guard, various highway patrols, and other law and order personnel, in the process costing considerable money.

A few riots flared in some of the larger cities where social and economic situations were such that anything at all became an excuse for rioting. In the process of the rioting, there was some looting and burning. A number of persons were injured, a few died. On some college campuses, students mounted good-natured demonstrations, various groups joining in to advance the causes of their special hang-ups, but none of the demonstrations really amounted to too much. Religious fanatics and other fanatics who were not religious held forth at street corners, parks, churches and halls. In certain areas, cult enthusiasms ran high. Newspaper columnists and TV commentators threw out a hundred different points of view, few of which, under any sort of scrutiny, made any sort of sense.

Stories grew—always of something that happened somewhere else, the preposterous index increasing with the distance—and embryonic legends began taking form.

The phenomenon of "being taken up" was heard increasingly, the reports coming from all parts of the nation, and snatched up swiftly to be exploited by the cults that had formed, likewise, in every corner of the nation. Various people claimed they had been "taken up," that somehow, never with an adequate explanation of how it happened, they had been introduced into the bodies of the visitors and, having been taken up, were either allowed to envision many wondrous things or were given messages (again, of many different sorts) that they were charged to transmit to their fellow Earthmen. The cult members, and many others, gave varying degrees of credence to these reports of being taken off, while a greater number scoffed. It was recalled that in the early days of UFO appearances, or supposed appearances, there had been many who had claimed direct contact with the crews of the flying saucers.

But however these reports, or other legendary stories, may have been inaugurated or spread, the populace became aware of one fact that could not be denied. The Earth had been invaded by creatures out of space and none of the things had happened that science fiction writers, through long years of scribbling, had foreseen as happening.

It all had turned out, as viewed by one editorial writer on the staff of an obscure little daily published in the depths of Tennessee, to be a sort of cosmic picnic.

In the northeastern corner of Iowa,

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a farmer had just finished his plowing on a 160-acre field when one of the visitors turned up at the field. It flew up and down the field, making neat turns at the end of each flight up the field, to go back down it once again, flying so low that it barely skimmed the new plowed surface. The farmer stood beside his machine shed and watched it.

"I swear," he told a newsman who came out from a nearby town to interview him, "it was as if that thing was planting something, or sowing something, in the ground I had just plowed. Maybe it waited until I had the plowing done before it showed up. When it had finished and had set down in a pasture, I went out to have a look—you know, to find out if it had sowed anything or not. But I never got there. That damn thing floated up and came at me—not threatening, you understand, not even moving very fast, but letting me know, plain as day, I was not to go near that field. I tried it several times, but each time it chased me off. I tell you, mister, I am not about to argue with it. It's a lot bigger than I am. In the spring, when it comes time for me to plant, I'll try it again. Maybe, by that time, it may have gone away or may have lost its interest. I'll just have to wait and see."

The reporter eyed the huge blackness of the visitor, squatted in the pasture.

"Seems to me," he said, "it's got something painted on it. Did you get close enough to make out what it was?"

"Yeah, plain as day," the farmer said. "The number 101, painted on it in green paint. Now I wonder what sort of damn fool would have done a thing like that."

In a medium-sized city in Alabama, the building of a stadium had been a local issue of some intensity for years, the issue fought out bitterly on the basis of funding, location and type of facility. But, finally, the issue had been settled and the stadium built. Despite all the disappointments encountered in the final decision, it was still a thing of civic pride. It had been furbished and polished for the game that would be the highlight of its dedication. The turf (live, not artificial) was a carpet of green, the parking lot a great extent of virgin asphalt, the stadium itself gay with pennons of many colors flapping in the breeze.

On the day before the dedication, a great black box came sailing through the blue and sat down, slowly and gracefully, inside the stadium, floating just above the green expanse of the playing field, as if the smooth carpet, so carefully mowed and tended, had been designed as a special landing space for big black boxes that came sailing from the blue.

Once the shock of rage had subsided slightly, there was great huddlings by official committees and interested civic groups. Some hope was expressed, early on, that the visitor might remain only for a matter of hours and then move on. But this did not happen. It remained within the

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stadium. The dedication was cancelled and the dedicatory game was postponed, occasioning major violence to the sacred schedule of the league.

The huddlings of the various groups continued and from time to time, suggestions were advanced and, amid great agonizing, all the suggestions were turned down as impractical. Quiet civic desperation reigned.

Sheriff's deputies who were guarding the stadium intercepted and arrested a small group of sport enthusiasts who were trying to sneak into the area with a box of dynamite.

In Pennsylvania, another visitor settled down in a potato patch. The owner of the patch stacked a huge pile of wood against the side of the visitor, doused it with gasoline and set the pile ablaze. The visitor did not mind at all.

27. LONE PINE

Sally, the waitress at the Pine Cafe, brought Frank Norton his plate of ham and eggs and sat down at the table to talk with him. The door opened and Stiffy Grant came fumbling in.

"Come on over, Stiffy," Norton called to him, "and sit down with us. I'll buy you your breakfast."

"That's handsome of you," said Stiffy, "and if you don't mind, I'll take you up on it. I been out watching them visitors of ours mowing down the trees. It was quite a walk, but I got up before light so I could get there early before any tourists showed up. Them tourists kind of take an edge off watching them. I wanted to see if maybe they were starting to bud, like the one that was here before."

"And are they?" asked Sally.

"Well, not yet. It seems to me it's taking them a little longer than the other one. But any day now they'll be doing it. They got long rows of those bales of white stuff strung out behind them. I been trying to think what that stuff is called."

"Cellulose," said Norton.

"Since when did you get so interested in the visitors?" asked Sally.

"I don't rightly know," Stiffy told her. "I guess it was from the very start, when this batch first sat down. You might say I was sort of involved with them. There was this girl writer from down in Minneapolis and that first night, I held the phone for her so she could talk to her editor when she

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got back and then I was the one who brought word to her when the second batch landed. I was sleeping off a drunk this side of the river and saw them coming down and right away I told myself she would want to know. It didn't seem right to me that I should go pounding at her door in the middle of the night, an old reprobate like me. I thought she might be mad at me. But I went and done it anyhow and she wasn't mad at me. She gave me ten dollars later on. She and that camera fellow she had along with her, they were real nice people."

"Yes, they were," said Sally. "So were all the newspaper and TV people. It seems a little strange that they now are gone. Of course, there are still a lot of people coming to see the baby visitors. Sometimes they go down to see the others, too. But these people aren't like the news people. They're just sightseers. Drop in for a cup of coffee and a doughnut, once in a while a sandwich, but they don't come for meals and they never tip. I suppose that in a little place like this, and not buying much, they don't feel there is any need of it."

"At first," said Stiffy, "I went out to see the visitors, every single day like I've done since they came, telling myself I should keep watch of them so that if anything happened, I could let that girl reporter know. But I don't think that's the reason anymore, not the main reason. I've got so I like to watch them for themselves. Once I told myself they were things from a long way off and that they really shouldn't be here, but it doesn't seem that way now. It's gotten so that they seem just like people to me. I used to be afraid of them, but now I'm not scared of them. I walk right up to them and put out my hand and lay it on their hides and they're not cold, but warm, just like a person's warm."

"If you're going to have breakfast," Norton said to him, "you'd better tell Sally what you want. I'm way ahead of you."

"You said that you were paying for my breakfast."

"That's what I said."

"Frank, how come that you..."

"Well, you might say that I had an impulse that I may be sorry for. If you don't hurry up..."

"Then," said Stiffy, "I'll have a stack of cakes with a couple of eggs, sunny side up, dumped on top of them. And if you have some sausages and maybe a piece or two of crisp bacon along with a couple of extra pats of butter..."

28. SOMEWHERE IN UTAH

The sergeant said to the colonel, "If these pissants of scientists don't get their cameras and them other damn fool instruments set up to their liking pretty soon, the sun will be down and we'll have to scrub this exercise."

"They want everything just right," the colonel told him. "It's got to be right the first time. We don't want to have to make a second try at it. You may not think so, sergeant, but this mission has the highest possible priority. It comes straight from

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Washington and we can't afford to goof."

"But Christ, sir, they sight in those cameras and then look through them and then sight them again. They been doing that for hours. They're a pack of fumbling old maids, I tell you. They got that chalk mark on the visitor's tail side and the rifle's sighted in on it. I sighted it myself and I know where it is pointing. The visitor hasn't moved and it still is pointing at the chalk mark. And that's another thing, why for Christ's sake, a rifle? Why not something a little heavier? You're not going to tell much bouncing a .30 caliber bullet off that big a mass. It won't do more than tickle it."

"Frankly, sergeant," said the colonel. "I have wondered about that myself. But that's what the orders say. They are most specific—a .30 caliber from a hundred yards. That and nothing else. It's got to be a .30 caliber from a hundred yards and the cameras and the other instruments must be positioned to the satisfaction of these gentlemen..."

The colonel broke off what he was saying when he saw that one of the scientists who had been fiddling with the cameras was walking toward them.

"Colonel," said the man, when he came up to them, "you may proceed with the firing. Before you fire, however, be sure that personnel is at a distance of at least two hundred yards. We suspect that there may be considerable back blast."

"I hope," the sergeant said, "that the electronic gadget you fixed up to fire the piece will work."

The man said, unperturbed, "I am sure it will."

"Now, sergeant," the colonel said, sharply, "if you will move the men out. We want to wrap this up as soon as possible."

The sergeant moved off, started shouting orders.

The scientist asked a technician, "The cameras are ready?"

"They'll start running with the signal that fires the rifle," said the technician. "There's so damn much film involved. Those cameras eat it up."

"Colonel," said the scientist, "it's time for us to move out with the rest of them."

The visitor stood as it had stood for hours, motionless in the midst of the sandy waste. The cross made in chalk shone dully against the blackness of its hide.

"What beats the hell out of me," said the colonel, "is how it has stood there all this time with us fooling around to set up the shoot. Doesn't it know we're here?"

"I'm sure it does," said the scientist. "My feeling is that it simply doesn't care. I would suspect it has some contempt of us."

Finally, the scientist halted his walking and turned about, the colonel turning with him.

"Sergeant," yelled the colonel, "is the area cleared?"

The sergeant bawled back. "It's all cleared, sir."

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The sergeant nodded to the man from Washington, who raised the tiny instrument he had been carrying in his hand and made a pressing motion with his thumb.

The rifle spat and the visitor spat back with a flood of raging energy that engulfed the mounted rifle. The colonel threw up an arm to shield his eyes against the brilliance of the flare. When he took it down, he saw that the rifle and the mount on which it had been positioned had turned into a shimmering whiteness from the heat. The whole assembly was slowly sagging to the ground. A clump of nearby sagebrush flared to floating ash.

The colonel glanced at the visitor. It was still where it had stood, as if nothing had happened, but the white chalk mark had vanished.

29. WASHINGTON, D.C.

Drink clutched in his hand, Senator Davenport paced up and down the room.

"Goddammit, Dave," he said to Porter, "you people down at 1600 have to take some action. You can't just let these things keep on taking over."

"But, Daddy," said Alice, "they're not taking over. They've not really done anything at all."

The senator paused his striding, stood glaring at his daughter.

"Not done anything!" he brayed. "They are using up our forests, they're eating lumberyards. They made away with those cars . . ."

"Old cars," said Alice. "Second-hand cars that some dealer was waiting to foist on an unsuspecting public."

"The dealer paid good money for those cars," her father said. "He took them in on trade-ins. He gave them room on his parking lot. He probably fixed them up. He was entitled to his profit. He had earned a profit."

"You say the administration should be doing something," said Porter. "Just what kind of action do you think that we should take?"

"How the hell should I know?" roared the senator. "I'm not the President, I'm not an advisor of his. If I did have some advice, he wouldn't listen to me. I don't know what is going on. Neither does anyone else. You're the press secretary; why don't you tell me what is going on? How much information do you have that you are holding back?"

"Offhand," said Porter, "I'd say scarcely anything."

"That milksop of a scientific advisor you have down there has been working on it," said Davenport. "He has a large force in the field, he's spending millions on his investigation. How come he's not come up with something? I heard today the army had made some sort of firing test against one of the visitors. Can you tell me what came out of it?"

"I don't know," said Porter.

"Dave, if you did know—let's just say you do know—would you tell me?"

"Probably not," said Porter.

The senator turned to Alice,

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"There you see," he said. "That's the kind of arrogance we can expect from the White House gang."

"Dave has said he doesn't know," said Alice.

"Also he said that if he did know he probably wouldn't tell me."

"You have to give him credit for being honest with you, Daddy."

"Honest, hell! It's arrogance, I tell you."

"Senator, I'm sorry if I seemed arrogant," said Porter. "Also, I am sorry there's nothing I can tell you. The fact is that you probably know as much as I do. And as for taking action of any kind at all, Alice is quite right. These things have done nothing that is actionable. Even if they had, what is there we could do about it? They're too big to hassle. I have a feeling it might be dangerous to try to push them around, even if we had reason to push."

"They're disrupting the country," said the senator. "The visitors are consuming some of our best timber stands and the building industry will suffer. A lot of lumberyards have been destroyed and the chances are that others will be. Lumber is already expensive and this will make it more expensive. New homes will cost more than they are costing now and the prices of new homes even now are so high that they are beyond the reach of most families.

"If the visitors don't cut out riding herd on planes, the airlines will cut back their schedules. Some of them already are talking about it. There's just too much chance of accidents and the insurance companies, realizing this, are about to boost their rates. The airlines already are screaming that insurance costs are prohibitive and that they can't stand another raise."

"More than likely," said Porter, "the entire situation is in a shakedown period. It may soon begin to straighten out. We are being hit right now with the worst of the impact. The public is a little nervous and upset and is inclined to exaggerate all consequences. Give it a little time..."

"I don't think the situation will improve with time," said the senator. "The public, you think, will settle down. I don't think it will. These goddamn cults and holy roller preachers are injecting a lot of emotionalism into the social structure. The cults are bad enough, but we can live with them. The people, in general, know that they are crackpot based and what to expect of them. The real danger is the outburst of evangelism, the rush to the brain of old time religion. History tells us that in the Middle Ages there were similar outbreaks of religious frenzy. The peasant walked away from his land, the artisans away from their shops, all of them going off on a spiritual binge. The same is beginning to happen now. Industry and business is suffering from increased absenteeism, costly errors are being made in the work that is done."

"It all comes down," said Alice, "finally, to the dollar. Our businessmen and industrialists are losing

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money, or afraid they will be losing money."

"And what's wrong with that?" asked the senator. "Money is the basis of our economic order. And while you may not think so, the basis of our social order as well. The country is starting a long slide to collapse. And those ninnies down at the White House don't even recognize it."

"I think we do," said Porter, "although we're not as pessimistic in our assessment as you seem to be. There are other things that call for priority consideration."

"What other things?"

"Well, a wide variety of..."

"Stop there!" shouted the senator, triumphantly. "I knew it! I knew there was something that you weren't telling me. Something you were hiding."

"Senator, I assure you..."

"You are onto something, aren't you? You've found out something about the visitors that won't bear talking on."

"Not that I know of," said Porter.

The senator sat down in a chair, gulped the remainder of his drink.

"You don't need to tell me," he said. "I wouldn't want to know, not until it's time for me to know, for a lot of us to know. And you are sitting on it. That's good. Not broadcasting it. Protecting it. I know that fuzzy-minded secretary of state wants to share what we find with everyone, including Ivan. We can't afford to share..."

"Senator, you are absolutely wrong. We don't know one single goddamned thing."

"Spoken like a gentleman," said the senator. "I knew you had it in you. I knew you could be counted on to keep your mouth shut."

He looked at the watch on his wrist. "It's getting late," he said. "I kept you longer than I should, ranting at you. You and Alice will be late for your dinner reservation."

30. LONE PINE

One of the visitors had fallen behind the others. It was standing still and was not cutting trees. On either side of it, the other visitors were continuing with their cutting, regularly spewing out the bales of cellulose behind them.

Stiffy Grant came to an abrupt halt as he came around the edge of the uncut forest and saw what had happened. He reached up a hand and tipped his hat back on his head, ran a hand across his brow to wipe it dry.

"Now what the hell?" he asked aloud. There seemed to be no answer. Studiously, he focused his eyes, but only with an effort. He reached for his back pocket and took out the bottle, uncapped it and put it to his lips, throwing back his head to drink. Finished with the drink, he eyed the level of the liquor in the bottle with some dismay. There weren't more than another two drinks left in it. It wasn't the best of liquor; in fact, it was the cheapest to be bought, but it was liquor and he mourned its disappearance. He recapped the bottle

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carefully and eased it into the back pocket, patting the pocket to make certain the bottle was secure.

Walking carefully so he would not fall (for if he fell, he might break the bottle), he set out to find what might be wrong. Maybe it got tired, he told himself, and had stopped to rest, although over all the time that he had kept tab on the visitors, not a one of them had ever stopped to rest or had given any sign of tiredness.

Norton had bought his breakfast for him and that meant that he had enough money left to buy another bottle of the booze. It was good to feel, he told himself, that he had at least another bottle in his future. That Norton, say what you might of him, was a decent man.

The visitor that was standing still turned out to be a greater distance off than he had estimated, but he kept plodding doggedly up the swath that it had cut, warily avoiding the bales that it had dropped, and finally reached it.

"What's the matter, fellow?" he asked, walking up and putting out a hand to rest against its hide. Once he put it there, he leaned against it for a moment to get himself a little steadied.

As he held his arm straight out against it to gain some steadiness, he knew there was something wrong, something not quite the way it had been before, although it took a little time for him to pinpoint the wrongness.

Then he knew. The visitor was cold. Gone was the pleasant, friendly warmth that he had always felt before when he had laid a hand upon one of them. He shook his head in amazement and took away his hand. He stumbled along it for a dozen feet or so and then laid his hand on it again. The hide was still cold, all the warmth was gone.

Fumbling his way along it, he laid his hand upon its hide time and time again. Always the hide was cold, stone cold. He turned and leaned his back against the visitor and slid down, collapsing to a sitting position.

Cold and motionless. No longer floating a few inches off the ground, but resting on the ground.

Could this be death? he asked himself. Could the visitor be dead? Cold and still and that was the way of death. And if it had died, why had it died? What had happened to it? And another thing—if it now were dead, it once had been living, but that was no news to him. For a long time, it had seemed to him, without question, that the visitors were alive. Not only alive, but friends. He wondered about that as he thought it, for it had been a long time since he had had a friend. It was strange, he thought, that he should have found a friend among people other than his own.

Huddled against the cold visitor, without even bothering to cover his face, letting the tears run unhindered down his stubbled cheeks, Stiffy Grant wept bitterly for a friend that he had lost.

31. MINNEAPOLIS

Al Lathrop, the managing editor,

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sat at the head of the conference table. He was idly tapping his pencil on the desk. Whatever are we here for? Kathy wondered. There were just the three of them, she and Jay and Johnny. Johnny could be expected to be here, of course, but not the others. Never before, in her time at the *Tribune,* had she ever been called into the conference room. Here it was that the various editors huddled, well before the first deadline, to discuss the stories they had, deciding what to do with them. Such news huddles, however, were held late in the day and this was only a little after lunch.

"I thought," said Lathrop, "that we should get together to talk about what long range plans we should be making in covering the story of the visitors. Since it started, it seems to me that we have done somewhat better than an adequate job. We have done it well—conscientiously and objectively. I think we will continue doing exactly that.

"But now it may be time to begin to think about possible new dimensions to the story. Johnny, you have been on top of it since the first of the visitors landed at Lone Pine. Would you have some thought about what we should be doing next?"

"Al, it's just possible that it's too early to try to do any more than continue to report the facts as we can determine them," said Garrison. "At first, we were dealing with a piece of news that had high shock value in itself. Our concern then, of course, was not to go beyond the most factual and objective reporting. The news itself, the bare recital of it, had sufficient impact. For my part, and I think in everyone else's opinion, it seemed important that we not engage in any kind of writing to increase the impact. In fact, there was no need to. Jay wrote a few general background articles, but he did not engage in any speculation beyond much that had previously been written before the visitors showed up. His articles were intended to do no more than inform our readers, as gently as possible, what concepts could be involved. Other than that, we stuck to straight news reporting."

"But, now," Lathrop said, "the public, in general, has accepted the situation. Many of them may not like it, may find it difficult to accept. But, by now, most everyone does realize that the visitors are here and may be staying for a while. My point is that now may be the time to embark on some background work, digging a bit more deeply into possible consequences..."

"Giving our readers something to think about," said Garrison.

"That's exactly it. Throw out a few questions they should be mulling over."

"Al, what you are saying is perfectly logical," said Garrison. "The time will come for that, but I still think it's too early. This kind of writing can only be done if a great deal of careful thought is put into it. We can't go off half-cocked. We have to have some information or at least some indica-

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tion of some sort of information before we can begin writing that kind of article. The information, I agree, need not be as solid as we'd want in writing factual news, but it would have to have some substance. Otherwise, we could be caught a long way off base. We could turn out awfully wrong."

"I didn't mean that we should immediately go into backgrounding. I didn't expect that we'd walk out the door and start writing think pieces. But it does seem we should be considering it, getting sorted out in our mind the kind of writing we'd like to see done. We have a lot of people out in the newsroom who have been spending a lot of time observing the visitors and writing about them. Some sort of concensus should be taking shape in the minds of some of these people. Kathy, you and Jay probably have been most involved of all our staff. Have you any thoughts about the situation? For starters, Kathy, how do you feel about the visitors?"

"I like them," Kathy told him.

"Well, now," said Lathrop, "I hadn't quite expected that. But go ahead and tell us what you like about them."

"For one thing," she said, "they haven't jostled us. They have been nuisances now and then, but done us no actual harm."

"A man was killed at Lone Pine."

"The man was the aggressor. He fired at the visitor. Since then, there has been no one hurt. The visitors have been decent people."

"People, Kathy?"

"Sure, they're people. Different from us, but they still are people. They are intelligent. I'd suspect they have an ethical sense."

"That may all be true," said Jay, "but my impression is that they are arrogant. They pay no attention to us. They ignore us, not studiously, as if they were working at it, but as if they honestly feel that we are not worthy of attention. At times as if they didn't even see us."

Kathy started to speak, but caught herself in time. If she could only tell them, she thought, but she couldn't. Not about Jerry, not even about the handshake she had experienced, although thinking of it as a handshake fell short of what it really had been. It had been something more than a handshake; it had been more personal and understanding than a simple handshake.

"Were you about to say something?" Lathrop asked her.

She shook her head. "Only to say that I do think of them as people. I wish I could say why, but I can't. I can't manage to define what I really feel."

"One thing I've wondered about," said Jay. "These things must have come from somewhere deep in space. It seems fairly apparent that they eat trees to provide cellulose as food for their young. They may even use some of the cellulose to feed themselves. That we cannot be sure about. But the point I want to make is that they probably are not from this solar system.

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On no other planet in the system would they find trees or anything else that would provide cellulose. Which would mean that they must come from some other solar system, probably from a planet that could produce cellulose. If this is so, then they must have crossed several light-years, perhaps a great many light-years, for it stands to reason that every solar system would not have a planet that could provide them with the cellulose they seek. Such a planet, with many differences, of course, would have to roughly approximate the Earth and..."

"Jay," asked Garrison, "just what the hell are you getting at?"

"There might be a number of considerations," Jay said, "but the one I'm most concerned about is that their trip must have taken a great deal of time. Physicists tell us that nothing can travel faster than the speed of light, probably not even close to the speed of light. This might mean that our visitors could have traveled for many thousands of years before they came to Earth."

"They must have been desperate," said Kathy, "to embark on such a journey. Something must have happened to drive them out into space to search for another planet, having no idea where they'd find such a planet, perhaps not even knowing they'd find one at all. But they needed cellulose to feed their babies. Until they found cellulose, they could have no young. They would have been facing racial extinction."

"You make quite a case for them," Lathrop said to Kathy.

"She may be right," said Jay. "The scenario she outlines could be close to truth. They may have had to look at a number of solar systems before they found one with a planet that fitted their needs. As I say, the search may have taken thousands of years. If that is the case, our visitors must be an extremely long-lived race."

"You're talking about some background articles," Garrison said to Lathrop. "Kathy and Jay have given you a hypothetical estimate that would make a dilly of a backgrounder. How would you feel about them going ahead and writing it?"

Lathrop shrugged. "I don't think so. It's just too theoretical. It has no solid basis. It would come out with a sensational sound to it."

"I agree," said Garrison. "The same objection could be made to almost anything else that might be written. It would all be based on supposition. We have nothing solid on which to base any background writing. The best we can do is stick to what can be seen. If we get into theorizing, we'll find that we have nothing on which to tie the theories. We can't pretend to understand what is going on because we are dealing with a life form so unlike us that there's no basis for understanding. Kathy's belief that these things had to find a place where they could raise their young makes sense so far as we are concerned, but does it make sense so far as the visitors are concerned? They may have few

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concepts that would match our concepts. Their intelligence and outlook, their life style, if you want to call it that, may be, probably is, in large part not understandable to us."

"Maybe you are right," said Lathrop. "One thing—I don't want any of us going off the deep end. In this matter, we simply can't afford to be sensational. By the way, Matthews, in our news bureau, told me this morning there was a rumor in Washington that some sort of weapon test was tried out on one of the visitors. Is there any news of that, any hint of it on the wires?"

Garrison shook his head. "Matthews filed just thirty minutes ago. The question was raised at the White House press briefing today and Porter, the press secretary, denied he knew anything about it."

"How much can you depend on what Porter says?"

"It's hard to tell. So far he seems to have been aboveboard. The scuttlebutt is that there is a hell of a row going on inside the White House, Porter insisting on full disclosure of everything about the visitors and some of the White House people wanting to clam up. If there were a weapon test, I would suppose it might be military. The chances are the results would be classified. Porter might have to cave in on something like that."

"Anything else?"

"Well, not much. Nothing but the regular flow of visitor news. A few days ago, a visitor showed up at an eastern Iowa farm, took over a freshly plowed field, went sailing up and down it until it had covered the entire field, then squatted down in a pasture to watch. It runs off everyone who tries to approach the field. The visitor, it seems, is an old friend of ours."

"What the hell do you mean? An old friend?"

"It has the number 101 painted on it in green."

Kathy jerked upright. "That's the one that was the first to land at Lone Pine," she said. "One of the federal observers painted the number on it. She was the one who had the babies."

"She?"

"Well, it had babies, didn't it? That makes it a she in my book. How come I missed that story?"

"It never got in the paper," said Garrison. "Got crowded out. Showed up in the slop. We'll get it in tonight. I don't know how it happened."

"We have to watch things like that," said Lathrop. "That's a good story. We should have run it."

"Al, it happens now and then. Not often. But it does happen. It's just one of those things. I've been wondering if Kathy should go down to Iowa and look into the situation. The visitor might remember her."

"That's ridiculous," said Lathrop. "Not a single one of them has paid any attention to a human."

"How do we know?" asked Garrison. "Sure, none of them has wandered over and said hello, but that doesn't mean they don't notice people. Kathy was at Lone Pine for several days and . . ."

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"What good would it do if old 101 did remember her? There's no way to interview one of them. No way at all to get any information out of them."

"I know all that," said the city editor. "I just have a hunch. I don't think it would be a bad idea."

"All right. Go ahead. You run the city room. If you have a hunch . . ."

The door burst open and Jim Gold thrust through it.

"Johnny," he said, "Frank Norton's on the phone from Lone Pine. Stiffy Grant has just found a dead one."

"A dead what?"

"A dead visitor," said Gold.

32. WASHINGTON, D.C.

Porter picked up the phone. "Dave," said the President, "can you come in? There's something I want you to hear."

"Immediately, Mr. President," said Porter.

He put the phone back in the cradle and got out of his chair. From her desk in the corner, his assistant, Marcia Langley, looked inquiringly at him.

"I don't know," said Porter. "More than likely trouble of one sort or another."

As he came into the outer office he made a thumb at the door to the President's office and asked, "Who is in there with him?"

"General Whiteside," said Grace.

"Only Whiteside?"

"Only Whiteside. He arrived a couple of minutes ago."

Porter knocked on the door and opened it. The President was perched on one corner of his desk and Whiteside was sitting in a chair against the wall.

"Come in, Dave," said the President. "Pull up a chair. The general has something rather strange to tell us."

"Thank you, sir," said Porter.

The President went around his desk and sat behind it, facing the two of them.

"I hear you had a rough half-hour with the press this afternoon."

"They wanted to know about some weapon test. I told them I had not heard of it."

The President nodded. "That's good. How did that sort of little white lie go down with you?"

"Sir," said Porter, "most things can be talked about and should. I assumed the test, if not a security matter, at least, was highly confidential."

"It's a good thing you assumed that," Whiteside said sourly.

"Which I take to mean that it might be a long time before anything at all can be said of it."

"That's why I asked you in," said the President. "I respect you and your viewpoint sufficiently that I don't want to leave you operating in a vacuum. When you hear what Henry has to say, I think you'll agree it should be kept undercover."

He nodded at Whiteside. "If you'll run through it again, Henry."

The general settled himself more firmly in his chair. "I think that both

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of you are familiar with the exercise. We mounted a .30 caliber and took movies of the bullet's path, thousands of frames a second."

The President nodded. "Yes, we know."

"It was totally incredible," said Whiteside.

"Okay, Henry. Go ahead. Tell us."

"When the bullet struck the visitor," said the general, "the skin of the visitor indented. The bullet did not penetrate. It simply made a dimple in the thing's hide. Like pushing a fist into a feather pillow. Like pushing a finger into your cheek. Then, almost immediately, the dimple rebounded back to its original position and a flare of energy bounced back, striking the mounted rifle and melting it. The funny thing about it is that the bullet itself, the projectile, was not thrown back, not all the way, that is. It bounced back for a short distance, then fell. Later we found it on the ground, where it had fallen."

The general stopped talking for a moment, sucking in his breath.

"Our people tell us," he said, "that is, our scientists tell us that what happened is that the visitor converted the kinetic energy of the projectile into potential energy. Doing that, you see, so that the energy could be handled. It's not absolutely certain, but indications are that the visitor absorbed the potential energy, analyzed it, and tossed back an even bigger flare of raw energy that destroyed the weapon. It struck the weapon square, dead-on, and that, the scientists say, is because the indentation was a parabolic indentation, its axis along the line of the projectile's trajectory. The indentation bounced back to its original position, but the shape of it was so precise that it threw back the energy, in some new form, exactly to its source. The scientists talked about a wave pulse or a reflected wave, but they lost me on that one. The point is that the visitor flung back the energy of the projectile, or at least that much, straight into the weapon that fired it. Even if the shot had been a lobbing shot, say, from a mortar, the return blast of energy would have followed precisely the trajectory of the projectile."

He paused, sucking in his breath again, looking from one to the other.

"Do you realize what that means?" he asked.

"A perfect defense system," said the President. "You toss to the other fellow whatever he throws at you."

Whiteside nodded. "And perhaps in different forms of energy. That's what the people at the lab think, anyhow. It wouldn't have to be a blast of heat. It might be radiation—say, a storm of gamma rays. The visitor can convert kinetic energy to potential energy and it may have a wide choice of energy conversions."

"How many people, besides the three of us, know of this?" asked the President.

"Quite a number of people, service technicians, troops and so forth, witnessed the exercise. If you mean what I've just told you, only three others than ourselves."

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"They can be trusted?"

"They can be trusted. There'll be no talk."

"I think, to be on the safe side," said the President, "we must insist the firing test never happened. Would you go along with that, Dave? I know how you feel..."

"Much as it goes against my grain," said Porter, "I would agree I'd have to. But it will be difficult to keep the cover on. Some of the servicemen, possibly some of the technicians, will talk. Isn't there some other way it can be done? Say yes, there was a test, but there were no clear-cut results, that what little data we got was confusing and inconclusive."

"My advice," said Whiteside, "is that we stonewall it. That's the only safe way."

"Dave," said the President, "I've never asked you to cover up before. I'm asking you to cover up now. There was, of course, the matter of the object in orbit beginning to break up. I think I made a mistake on that one. You argued for full disclosure, but I weaseled on you. I made a mistake. I should have turned you loose rather than using the NASA announcement. But this is a different matter."

"This," said Whiteside, "could give us the edge we need. If we only can find out how it's done."

"We could call in Allen."

"Mr. President," said Whiteside, "I wish you wouldn't. Maybe eventually he can help with an answer, hopefully without actually knowing what he's doing. But he shouldn't be told about this. Six men know about it now; six men are too many, but there's nothing we can do about that. Let's keep it at the six. Allen is soft and a bit given to talk. He is somewhat bitten with the idea that scientific knowledge should be shared. The force that he has pulled together is working outside security and..."

"You don't need to belabor the point," said the President. "You are entirely right. We'll keep Allen out of it."

"My people think," said the general, "that with the visitors it is not a matter of defense at all. Not defense against an enemy, that is. They think the visitors absorb energy from any source that is available. Out in space, they'd absorb energy from all sorts of radiations or from small particles of matter, perhaps on occasion rather large particles of matter that might collide with them. In such an instance, they can convert the kinetic energy of such particles into potential energy, absorb what they can of it and reject that part they can't absorb. The ability is a sort of built-in safety valve against excess energy."

"You used a .30 caliber projectile," said the President. "Do you have any estimate of how much larger projectiles the visitors could withstand?"

"I suppose a nuke might destroy them," said the general, "but the probability seems to be they could withstand anything short of that. The dimple made by the rifle bullet was small and shallow. The dimple would increase in size with anything heavier,

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but there is plenty of leeway. The visitor we used for the test didn't seem to notice. When the bullet struck, it never even flinched. It was standing, doing nothing, before the test. At least, nothing we could notice. It was still standing there, doing nothing, after the firing. What I'd like to do is try something a little heavier, progressively heavier firing tests."

"You can't do that," warned Porter. "You would blow your cover. Maybe we can get by, just barely get by, denying this one test. If you tried others, there wouldn't be a chance."

"That's right," said the President. "For the moment, we must be satisfied with what we have. What we must do now is find what the visitors are. How they are made. How they operate, if that's the word. Allen may be pulling something together soon that will help us."

"He hasn't much to work on," said Porter. "About all his people can do is stand to one side and observe."

The box on the President's desk beeped. Frowning, he reached out and punched a button.

"Grace, I thought I told you..."

"I'm terribly sorry, sir, I thought you'd want to know. Dr. Allen is here. He says he must see you immediately. It seems that someone out in Minnesota has found a dead visitor."

33. MINNEAPOLIS

The room was closing in on him and that was strange, for it had not closed in before. For the first time since he had lived there—a long two years—he became aware of the room's smallness, its cluttered bareness, its squalidness. He saw the grime upon the windows, the water streaks upon the wall.

He shoved the papers on the desk to one side and stood up, looking out the window to where kids where playing one of those nonsensical, running-and-yelling games that had no significance to anyone but themselves. An old woman, struggling with a grocery bag, was limping down the broken sidewalk. A dog sat lopsided before the stoop of a ramshackle house. The old wreck of a car, its battered fenders drooping disconsolately, stood in its accustomed place beside the curb.

What the hell is the matter with me? Jerry Conklin asked himself. And asking, knew.

It was this visitor business. It had preyed upon him ever since it had happened. He had not, since then, been himself. The worry of it had robbed him of his dedication as a student, had nagged at him almost every waking hour. It would not let him be. It had interfered with his work on his thesis and the thesis was important. He simply had to get the thesis written.

Would it have been better, he wondered, if he had come forward to tell the story of what had happened to the proper authorities? And having gotten rid of it by the telling of it, he might now be shut of it and able to get down to work. Yet, for some reason, he had not been able to do that. He had told himself that he balked against the ridicule and the hidden

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laughter the story would have brought, although that might not be the only reason. Although he could not imagine what other reason there might be. He had thought that telling it to Barr might be some help, but it hadn't been. The exobiologist, despite the fact that he had listened without laughter, had been no help at all. Nor had the telling of it, even under the circumstances, had the cleansing therapy of a confessional.

And, now, he simply could not tell it. Telling it now, so long after the fact, would lump it with the stories all the kooks were telling about being taken up by the visitors. Telling it now would do no more than link him with the lunatic fringe that had sprung up with the advent of the visitors. Difficult to tell his story before, it was now impossible.

Although, more than likely, he was not through with it yet. At some time, the investigators who had hauled his car away would find a license plate or a motor number and the car would be linked to him. Perhaps, he told himself, they already had found the evidence that would link him to the car. He had done nothing about the car and perhaps he should have, but had not been able to decide what to do. He should have reported its destruction to his insurance company, but what could he have told them? For a time, he had considered reporting it stolen, but had not acted on that impulse. If he had, he probably would find himself in more trouble that he was right now.

He moved away from the window and back to the desk. Sitting down, he pulled the papers in front of him. No matter what, he told himself, he had to get some work done that afternoon. Kathy would be picking him up at six or so and they'd go out to eat.

Kathy, he thought. What the hell would he have done without her? It had been her strength and steadiness, her loving solicitude that had carried him through the last few days.

The phone rang and he picked it up.

Kathy said, "Jerry, I'm so sorry. I can't see you tonight. I'm going out of town. Up to Lone Pine again."

"Oh, hell," Jerry said. "I had been sitting here, counting on seeing you. What is it this time?"

"They've found a dead visitor up there. Washington probably will be sending in investigators. We have to have someone up there and Johnny picked on me."

"A dead visitor? What happened?"

"No one knows. It was just found dead. Stiffy Grant found it. You remember Stiffy. I introduced you to him."

"Yeah, I remember him. Tell me, how would Stiffy know if it was dead or not?"

"It was cold," she said. "No longer warm, but cold. And it wasn't floating. It was resting on the ground."

"And now they're going to rush in and dissect it to find out how it works."

"I suppose that's the idea," Kathy said.

"It has a gruesome sound to me."

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"To me, too, but it's logical."

"When will you be back?"

"I don't know. A day or two, I think. I will see you then."

"I was counting on seeing you tonight."

"So was I. Jerry, I'm awfully sorry. And so disappointed."

"Oh, well, you have a job to do. So have I—the thesis. I'll get some work done on it."

"And, Jerry, something else. Old 101 has been found."

"101?"

"Yes, don't you remember? I told you. How one of the men from Washington painted a green 101 on that first visitor to land."

"Yes, you did tell me. So it has been found. Where is it?"

"On a farm near a little place in Iowa. Davis Corners. The farmer thinks it planted something in the field and now is guarding it. When he approaches the field, it runs him off."

"What could it have planted?"

"Maybe nothing. That's only what the farmer thinks. Johnny was going to send me down there, then this Lone Pine business came up."

"Why should he have sent you down there? What could you have done?"

"It was just one of Johnny's hunches. He operates by hunch, runs the city desk by hunch. Some of the hunches are good, some of them pay off. Some people might call it a newspaperman's intuition. Actually, it's hunch. Now I have to go. The plane is waiting and Chet is standing here, first on one foot and then the other."

"I'll miss you, Kathy."

"So will I miss you. Get lots of work done while I'm gone."

"I'll try. Thanks for calling, Kathy."

He hung up the phone and sat idly at the desk. The room closed in on him again. He saw the grimy windows and the streaks upon the wall.

Old 101, he thought. Somewhere down in Iowa, guarding a field. And why should it be in Iowa? There were no trees in Iowa, or at the best, few trees. Nothing like the trees in Minnesota. The farmer thought it had planted or sowed his field. And what could it have planted? He shook his head, puzzled. The farmer, he told himself, must be mistaken.

He got up from the desk and walked up and down the room, remembering again, with a sharpness that terrified him, those few hours (or few minutes?) he had spent inside the thing that was 101. He saw the luminous disks again, the pale blueness of the light, the strange flickerings. There had been something there, he thought, that he should have understood, some fact or facts that, had he stayed a little longer, he might have been able to perceive.

If he could have stayed a little longer, if he could talk with it again—and stopped himself, damning himself for a fool. For he had never talked with it, never really talked with it. From it he had done no more than gain impressions, the sense of home and the sense of trees. And those im-

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pressions, he told himself, bitterly, might not have come from 101 at all. They might have come from some unexpected abberations in his mind.

He went back to his desk and sat down again, pulling the papers in front of him, picking up his pen. But he could not work. The writing that he'd done no longer was writing, but strange, alien squiggles. He stared at the squiggles, trying to make them out, startled by his not being able to make them out, angry and confused, his mind churning.

Maybe, he told himself, the answer might be there, down on that farm in Iowa. And that, he thought, was sheer insanity. He could go to Iowa, out to the farm, and 101 would chase him off, even as it had chased the farmer. He was dealing in a fantasy and knew it, but knowing it did no good. The fantasy still hung on. The impulse became a certainty—he had to go to Iowa. Although what he'd do once he got there, he had no idea.

He rose from the desk and paced up and down the room, fighting it out with himself. One idea hammered at him, zeroing in on him. He needed an answer and this was the only way that he could think of that might provide an answer. It might turn out to be nothing, but he couldn't pass it up. He had to take a chance. He had to play his hunch. Johnny Garrison was a hunch player, Kathy had said, and at times, his hunches did pay off.

He fought it out half the afternoon and it would not go away. He had to go to Iowa. He had to go to Iowa and he didn't even have a car. But Charlie would let him use his car. If he asked, Charlie would loan the car to him.

Limp and sweating, he lifted the phone and dialed Charlie's number.

34. LONE PINE

Looking through binoculars, Kathy could see, across the river, the knot of men who were at work on the dead visitor. There was no way she could make out what they were doing. The only thing she could determine was that in some manner (using saws, she wondered?), they had cut sections out of the dead body, probably securing samples to be taken back to Washington, or perhaps elsewhere, for closer examination. They were busy with a number of pieces of equipment, but the distance was too great to make certain what they were doing. There had been no chance to talk with anyone who might answer her questions. Security was tight. The bridge the Army Engineers had thrown across the river was closed by national guardsmen and other guardsmen patrolled the riverbank to stop anyone who might try to cross.

The other visitors paid no attention to what was going on around the dead body of their fellow. They continued cutting timber and spewing out the bales of cellulose. Some of them were budding and a dozen or so of their young were scurrying about, chomping at the bales of cellulose.

Kathy lowered the glasses, laid them in her lap.

"Anything to see over there?"

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asked Norton.

"Nothing I can make out," said Kathy. She handed the glasses to him. "You want to have a try?"

"Even if I saw something, I'd probably not recognize it," said Norton. "I thought maybe they would try to move the dead visitor somewhere. To the university down at Minneapolis, maybe. But I guess it's just too large. That thing must weigh tons."

"Maybe they will later on," said Kathy, "but as I understand it, it was important to get some tissue samples as soon as possible, if what they are getting can be called tissue."

Norton lifted the glasses to his face, stared through them for a long time, then took them down, handing them to Kathy.

"I've never seen such tight security," said Kathy. "Nor set up so fast. Chet and I got here only a few hours after you phoned us, but by that time, they had it buttoned up. Ordinarily, there would be some sort of public relations setup to give you some idea of what might be going on. But here there's nothing. Not even someone around to tell you there'll be no information. We're just locked out."

"Washington probably figures this is important. Top secret."

"Sure they do," said Kathy. "And more than that, they were caught flat-footed and had to move fast. Who would have expected that one of the visitors would die and they'd have a shot at it. When we write about how tight the security is, the government will complain. Claiming we are over emphasizing."

"In a little while," said Norton, "Lone Pine will be swarming with newsmen. Like it was before. Maybe then someone will be able to jar something loose."

"I tried," said Kathy, "but there's no one to jar. Just those silly, flat-faced guardsmen who won't let you through. Most of them won't even talk to you. Not even the officers. Usually officers will talk, at least a little, to show you how important they are, if for no other reason. I tell you, Frank, I don't even know why I'm here. I could just as well have stayed back in the newsroom. Here I'm not doing any good. I don't know what the hell I'll tell Johnny when I phone him. Maybe someone else could have done better. Maybe Jay..."

"I don't see how," said Norton. "As you say, there's no one here to talk to."

"What beats me," said Kathy, "is that there aren't even any rumors. In a tight security situation such as this, there are always rumors. Someone had heard something and are embroidering on it. But here there isn't even that. Stiffy is just as empty as I am. You'd expect that by now Stiffy would have heard something that he could enlarge a bit and pass on. Nor Sally, either. If she'd heard something, I'm sure she'd tell me."

"You got to hang in there," said Norton. "If you hang in long enough..."

"Jerry and I were going to have dinner tonight," said Kathy. "Both of us

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were counting on it. It's been a long time since we've shared a dinner—a sit-down dinner, not just grabbing a hamburger at a fast-food joint. Poor Jerry, he's had a bleak time of it. Six years as a student, living hand to mouth, picking up odd jobs so he can get the little money that he needs, living in a tiny room. I thought we should get married. Then, at least, he'd have a decent place to live, but he would have none of that. He refused to let a woman support him. The man has pride and I respect him for it, but that doesn't keep me from feeling sorry for him, and he'd be sore if he knew I felt sorry for him. So I can't show it. We could have shacked up and that would have made it easier for the two of us, but neither of us wanted that. There's nothing really wrong with it; a lot of people do. But both of us shied away from it. I don't know. It seemed sort of cheap and both of us agreed . . ."

"It'll work out," said Norton, trying to comfort her. "He's only got a little while before he has his doctorate and then he'll get a job . . ."

"I don't know why I'm telling you this," she said. "I shouldn't, but it just came out of me. Frank, why should I be telling this to you?"

"I don't know," said Norton, "but I am glad you could. If it helped you any, I am glad you could."

They sat silent for a time in the autumn afternoon.

Finally, Norton said, "In a day or two, before the end of the week, I'll be taking a few days off. I do it every fall. Usually earlier than this. This matter of the visitors makes me late this year. I'll drive up through the wilderness area, a canoe strapped to the top of the car. I'll park beside a little river that I know and will spend a few days canoeing. A sort of farewell to the autumn wilderness, a few days with it before bad weather closes in. I just paddle along and look, taking it easy, not pushing myself. I won't work at it. Maybe do a little fishing. Mostly looking, though."

"It sounds nice," said Kathy.

"I was thinking. Why don't you phone Jerry and ask him to come up here. Tell Johnny you're taking some vacation. The two of you join me on this little jaunt. You get away from your deadlines, Jerry from his classes. It would do the both of you a world of good."

"I think it would," said Kathy, "but we can't. I used up all my vacation time in June and Jerry's got his thesis."

"I'm sorry," Norton said. "It would have been nice to have had the two of you along."

"I'm sorry, too," said Kathy. "Thanks so much for asking."

35. WASHINGTON, D.C.

The President came into the press office as Porter was preparing to leave. The press secretary rose from his desk, surprised, and said, "You are working late, sir."

"And so are you," said the President. "I saw your light and decided to come in."

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"Is there anything I can do for you?"

"Only listen to me," said the President. "I need someone I can sit down with and take off my shoes."

He walked to a sofa against the wall and dropped into it, slouching, stretching out his legs, locking his hands behind his head.

"Dave," he asked, "is all of this really happening or am I having a bad dream?"

"I fear," said Porter, "that it is happening. Although there are times when I ask myself the same question."

"Can you see an end to it? A logical end?"

Porter shook his head. "Not at this point, I can't. But I have a sort of ingrown faith that it will work out. Even the worst situations usually do."

"All day long," said the President, "I have people hammering at me. Things they want me to do. Actions they want me to take. Probably silly things, but to the people who advocate them, I don't suppose they're silly. I have a stack of letters asking me to designate a day of prayer. I have phone calls from men I have always regarded as reasonable suggesting a proclamation calling for a day of prayer. And I'll be goddamned if I'm going to call a day of prayer. Sure, presidents at various times have asked the people to observe a day of prayer, but only on occasions that patently call for prayer, and I don't think this situation does."

"It stems from all the religious fervor this business has stirred up," said Porter. "When people don't know what else to do, they suddenly turn to religion, or what for them may pass for religion. It constitutes a mystic retreat into unreality. It is a search for an understanding of forces that are beyond our capability to understand, a seeking for some symbol that will bridge the gap to understanding."

"Yes, I realize all that," said the President, "and, in a way, I can sympathize with it. But to call for prayer right now would over emphasize the problem that we face. What's happening baffles the hell out of me, but I feel no sense of panic. Maybe I'm wrong, Dave. Should I be feeling panic?"

"I don't think so," Porter said. "It's not a matter of panic. What is driving these people to urge a day of prayer is the obsessive urge of the suddenly devout to force everyone else into at least a simulation of their state of mind."

"I've tried over the last hour or so," said the President, "to sit quietly by myself and try, somehow, to get straight in my mind what we are really facing. Thinking, I suppose, that if I could get that straight in my mind, I might just possibly be able to figure what to do. The first thing I told myself was that, as of the moment, we are not facing any threat of violence or coersion. The visitors, as a matter of fact, have been quite well behaved. It looks to me as if they may be making an effort to understand the sort of society we have, although there must be some aspects of it that are hard for them to understand. And if they are

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doing this, I told myself, then they must intend to operate within the parameters of our society in the best way that they can. I can't be sure of this, of course, but that's the way it looks and I gain some measure of reassurance from it. Of course, at any time at all, something might happen that will change it. The police down in that Alabama town where the visitor sat down in the stadium arrested a bunch of dimwits trying to get into the stadium with a box of dynamite. I suspect they intended to blow up the visitor."

"Even had they succeeded," said Porter, "they probably would have failed. It would take more than a box of dynamite, most likely, to inconvenience one of the visitors."

"What you say is true, Dave, if the data from Whiteside's firing test is accurate and I assume it is. But it would have been a deliberate act of aggression that could change the attitude of the visitors toward us. Until we know a whole lot more than we know now, we can't afford to commit an act of violence, even an unintentional act of violence. I have a feeling that the visitors, if they put their minds to it, could outdo us in violence. I'd not like to come down to a shooting match with them."

"We do need to know a lot more about them," said Porter. "How is Allen making out with the dead visitor? Have you heard anything from him?"

"Only that the investigation is underway. He's doing the preliminary work on the spot. Once that is done, an effort might be made to move the body to some facility where the work can be carried out under more favorable circumstances."

"Moving it might be quite a chore."

"I am told there are ways it can be done. I understand the Army Corps of Engineers is working on the problem."

"Any indication of why the visitor might have died?"

"It's funny that you should have asked that, Dave. That is one of the first questions that popped into my mind. Seems to me that when something dies, the inclination always is to ask the cause of death. All of us are very much concerned with life and death. H. G. Wells popped into my mind immediately. His Martians died because they were defenseless against the diseases of the Earth. I wondered if some bacterium, some virus, some fungus might have done the visitor in. But the cause of its death apparently was a question that Allen never thought of. At least, he said nothing about it. He was just excited that one of them had been delivered into his hands. There is something about that guy that gives me the cold shivers every now and then. Dammit, there are times when he doesn't seem human. He's too much the scientist. To him the scientists are a brotherhood set apart from the rest of humanity. That attitude bothers us. The chances are that Allen and his men will learn something about the visitor that it might not be wise to

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advertise. I have tried to impress this on him and I think he understands, but I can't be sure. I know how you feel about this, Dave, but . . ."

"If there is information that shouldn't be made public in the interest of national security," said Porter, "than I'd go along with holding it back. What I object to is secrecy for the sake of secrecy. I am confident the findings from the dead visitor can be handled. Certainly, there will be something that can be safely announced. If there is enough of that sort of information, the media can be satisfied. Some of them may suspect the full story is not being told, but there's not too much for them to complain about. What worries me are the people who are doing the investigating. The press could get to some of them."

"I warned Allen on that. He is using only men in his own department—not the people he recruited from outside. He swears that he can trust them. It is unlikely that anyone can get to them, let alone talk to them. We've got a security net around Lone Pine a snake couldn't wriggle through."

The President hoisted himself to his feet and started for the door, then came back and sat down again.

"There's another thing I don't like," he said. "It's that goddamned U.N. There is a push to declare that the visitors are an international, not an internal, matter. You are aware of it, of course."

Porter nodded. "I had some rather sharp questions on it at today's briefing. For a while, the boys had me skating on thin ice."

"The resolution is going to be voted," said the President. "Sure as hell it will. There's no way we can stop it. Only half a dozen governments will stand with us. We've twisted all sorts of arms, but there is little we can do. All our little sanctimonious underprivileged brothers that we're breaking our ass to help will vote against us."

"They can pass the resolution. They'll play hell enforcing it."

"Sure, I know that, but we'll get a bloody nose for all the world to see. We'll drop a lot of prestige."

"Maybe it is time to let the prestige go. This is our show. We are the ones who have the visitors on our backs."

"Dave, you may be right. But there are other considerations. State is frantic at the prospect."

"State is always frantic."

"I know. But it's not only State and the U.N. resolution. There are others who are giving us heat. The environmentalists are up in arms because we are doing nothing to protect our wilderness areas against the visitors. The lumber interests are howling to high heaven. The farmers, seeing visitors come down and roost in the middle of their fields, are getting restless. The airlines are threatening to cut their schedule. The entire business world is in an uproar. The stock markets are reacting like a yo-yo. At times, I catch myself thinking and I know it's wrong to think it, but I can't help it—why did it have to be us? Why

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couldn't it have been Europe or South America, or even at times, God help me, the Soviet Union?"

"I can understand how you might feel that way," said Porter. "There is so damn much . . ."

"If only I could win once in a while," said the President. "If I didn't have to fight so hard for every inch of progress. Take the energy bill. It all makes sense, it is all possible within the state of the art. I could bring in hundreds of top notch engineers who would swear that the plan is practical. A solar energy farm in the deserts of the Southwest, a few more millions to nail down a cryogenic transmission and storage system. Another year is all it would take, the engineers tell me, a few more million. Enough energy to power the entire country, a transmission system that could distribute or store the energy with virtually no loss of power. But does Congress see it that way? Hell, no, they don't see it that way. Half of them are in the clutches of the big energy corporations, the other half so stupid that it's a wonder they can find their way home when they leave the Capitol . . ."

"Some day," said Porter. "Some day they'll come around to it. Soon or late, they'll have to see . . ."

"Sure," said the President, "some day. I'll tell you when that some day will be. When gasoline costs five bucks a gallon and you have to wait in line for yours to get the three gallons your ration card allows you. When you go cold in the winter because you can't afford to use enough natural gas to keep warm. When you find that you use 25-watt light bulbs to hold down the lighting bill . . ."

36. IOWA

The sun had set and the early evening dusk was settling in when Jerry Conklin turned into the gas station.

"Fill the tank and check the oil," Jerry told the attendant.

While the attendant was busy at the pump, Jerry walked to the edge of the road. The station was on the outskirts of one of the many small villages through which he'd driven; a quiet little trading center for the farming country that surrounded it. The town, the same as all the others, was made up of rows of small, neat houses and a tidy business district. Lights were coming on in some of the houses and there was little traffic on the road. An evening hush had fallen over the community, broken now and then by the yapping of a dog.

Jerry stood at the side of the road, looking up and down it. Within himself the ache still persisted. He had been stupid, he told himself, driven by an illogical need that he could not define. He should have known, he told himself, that the trip would come to nothing. It had been silly to think that 101 would recognize him—although, in a way, it might have recognized him. But if it had been recognition, he could find no comfort in it.

He had driven to the farmhouse late in the afternoon after several failures

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to find the place and having to stop along the way for further directions.

The farmer had been in the farmyard, puttering around with a hammer and nails, repairing a pigpen fence.

"Yeah, it's still sitting there, guarding the field," he had said. "But it won't do you no good to go over there. You're welcome if you want to try, but I know what will happen. I'd go with you, but I got work to do. These hogs have been breaking out of here and I have to repair the fence so I can keep them in."

Jerry had walked to the field. Old 101 sat there, in a hayfield off to one side of the plowed strip of land. It made no move to chase him off. It just kept sitting there. He had walked out to it and walked around it, staring up at it, trying to remember how it had looked when it had landed on the bridge. But while the memory of it straddling the river, with the bridge gone to kindling wood under its impact, still was sharp and clear, he found it difficult to equate it now with the way it had appeared the time he first had set eyes upon it. Somehow it seemed smaller now, although, God knows, it was still big enough.

He had walked around it and moved up close against it, laying his hands upon it to feel the soft warmness of it. He had patted it gently and poked it with a playful fist. And it gave no sign.

"Tell me" he had said to it. "Tell me what I need to know."

It had told him nothing. It had paid no attention to him. But he was sure it knew that he was there. How he could be so sure of that, he did not know.

He had given it plenty of time. He talked to it. He laid his hands upon it and still it made no sign. So finally he had walked away, going slowly, turning back every now and then to look at it, but each time he turned to look, it still sat there as stolidly as it had been sitting all the time.

Although, he told himself, it had not chased him off. It had chased off everyone else who had approached it, but it had made no move against him. And that, in itself, he thought, might be a sign of recognition.

"Mister," said the station attendant, walking up to him and holding out the dipstick, "you need a quart of oil."

"All right, put it in," said Jerry. "This car always needs a quart of oil."

He paid the man and, getting into the car, drove out to the road and headed toward the town.

But when he reached the business district, he drove around a block and came out on the road again, heading back the way that he had come.

He was going back to that farm again and just why he was going back was not quite clear to him. An essential stubbornness perhaps, he told himself, a desperate unwillingness to give up, a very stubborn faith in his silly conviction that there might be an answer he could get from 101. He didn't deliberately decide to go back, he didn't argue it out with himself, he didn't ponder it; he simply drove

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around the block and it was not until he was headed back down the road the way that he had come that he realized he was going back. Now that he had done it, he did not try to fight it.

He couldn't drive back to the farmyard again, he knew. While the farmer had been cordial, he had seemed a little nettled when he found that Jerry had not been chased by the visitor. Jerry had imagined that he detected in the farmer's face some trace of a dark suspicion.

Actually, he told himself, he did not need to go back to the farmyard. By walking half a mile or so, he could reach 101 by parking on a gravel township road. It would be dark by the time he got there and it was unlikely that anyone would spot him. The night was clear and in a little while, a near-full moon would be coming up and there'd be light enough to get where he was going.

He had a few bad moments when he got close to the farm, fearing that he would be unable to locate the place. But there were a few landmarks that he remembered—a rickety iron bridge spanning a small stream, a lone oak standing in a pasture close to an old haystack. Shortly after ten o'clock, he found the gravel road, drove it up for a mile or so and parked. From there he calculated that he would be able to spot 101.

Either his navigating had been better than he'd known, or he was just plain lucky, for in a little time he did locate the farm and the dark bulk of 101 squatting in the hayfield. He was, however, farther from it that he had expected he would be. He began hiking across the fields, stumbling occasionally when a foot caught in furrowed stubble. He had to work his way through a couple of barb-wire fences and in the dark, that was a ticklish job to do. The night had turned chilly and he buttoned up his jacket, turning up the collar as protection from the wind. Down in a ravine off to his left, an owl was making tentative hoots every now and then, testing out its voice, and when the wind veered slightly, he could catch the baying of a distant dog.

He moved through a lonely emptiness and yet an emptiness that seemed to hold some threat within it. He had the feeling that at any moment, something could come welling up out of this land he crossed, although he never could quite determine what it might be that would come welling up.

The walk seemed to take forever. There were times when it seemed to him that he had not moved at all, that despite all his walking, he was only marking time in the self-same place. To make up for that, to overcome that terrible feeling of no progress, he drove himself without mercy, sometimes running. But he soon quit the running, for it brought too many stumbles. Then, suddenly, he was there. In front of him loomed the moon-limned bulk of 101.

He staggered across the last few yards and collapsed against the visitor, protected by its massiveness

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from the chill of the northwest wind. He had a strange compulsion to stay huddled there, as if he had reached some sort of refuge and must cling to it. But that was silliness, he knew, and staggered to his feet, leaning his head against it as he fought to regain his breath.

Leaning against the great black wall that rose above him, he tilted his head and saw the quiet sparkling of the stars that were cut off abruptly by the soaring blackness that was 101. The loneliness stayed on, the loneliness and lostness. He had thought that it perhaps would disappear when he reached the visitor. But reaching the visitor, it seemed, had made no difference.

He had done it again, he thought. He'd come back again to repeat the folly that he had committed earlier in the day, the act of folly that had commenced that moment in his room when he had picked up the phone to ask Charlie if he could use the car.

Yet he had been so sure—not sure in any sense of logic, but sure in a way that was beyond all reason.

His breathing had grown even now. He stepped back from the visitor, slowly began to turn about to face the fields again, reluctant to turn around, reluctant to take that first step that would lead him back to the car parked on the gravel road.

And, in that instant that he took the step, a snakelike something came swishing down upon him and snapped like an iron band about his chest. In mid-air he caught a glimpse of the autumn-bare fields, lit weakly by the moon, a glimpse of a tree bordered creek that angled down a valley, the sudden flash of light from a distant farmhouse.

Then he was in that strange darkness that was not dark, but blue, caught a whiff of the dank mustiness that lurked in the dry, hot air. There was once again the swiftness of the flaring and the flickering that revealed impossible shapes that would not stand still long enough to see. The rows of circular eyes still were staring at him. It was, he thought, as if he'd never left this place.

He had fallen to his knees and now he rose slowly to his feet and as he did, he reeled under a flood of hammering sensations that assailed him out of nowhere. He went to his knees again and stayed there, head bent, hands against the floor to keep from falling flat upon his face.

And all the while the sensations hammered at him, thundering in his brain, so many and so powerful that he could not shut them out, nor able to distinguish what might be the import of them.

"Take it easy," he gasped. "Let up. Let me have a chance."

The sensations went away and he swayed a little, as if he might have been leaning against something for support and it had been suddenly snatched away.

Then the sensations came again, but softer now, stealing up on him, as a cat might creep upon a bird.

TO BE CONTINUED

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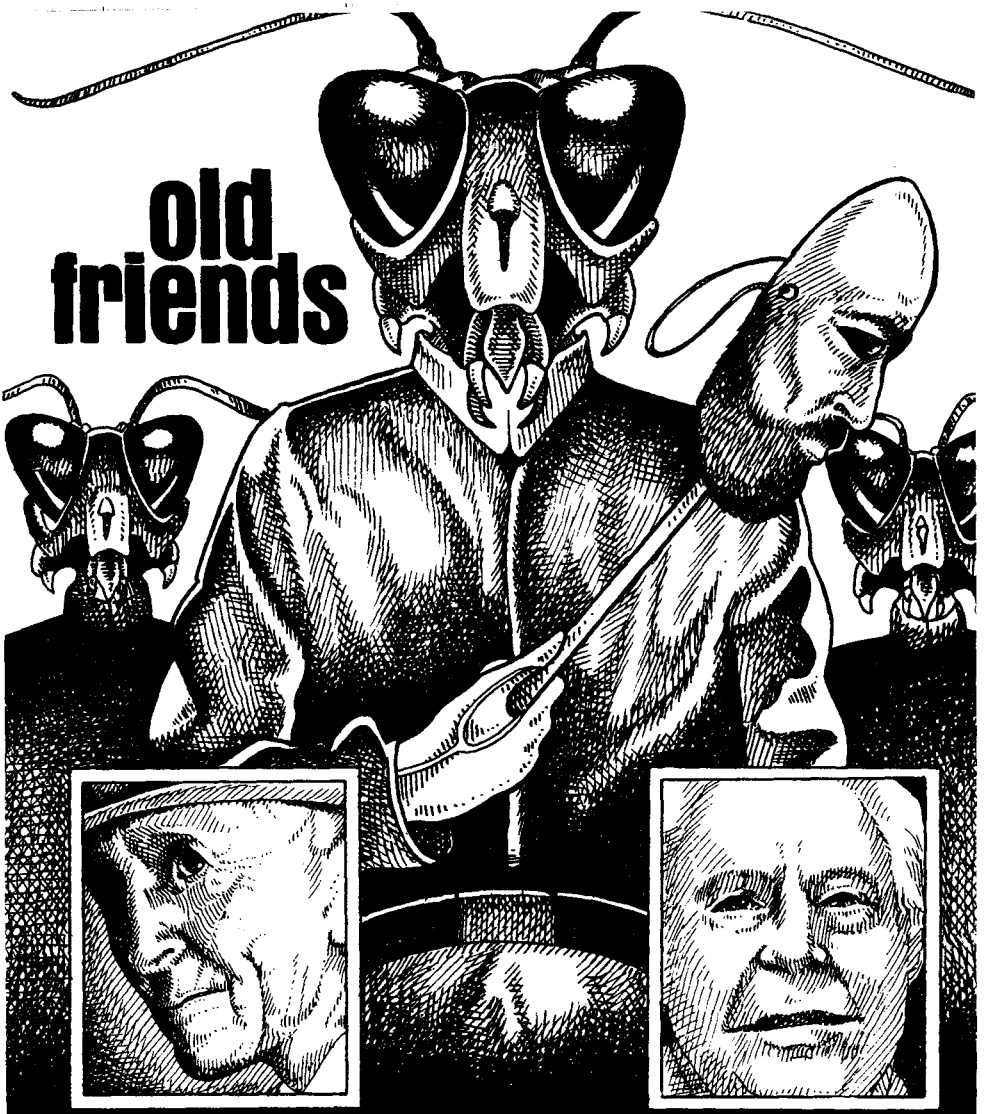
old friends



Momentous conflicts do not always take place on monumental battlefields.

KEVIN O'DONNELL JR

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Late autumn in Cleveland, and the wind off the lake chilled the plaza's flagstones. Burger King bags blew through flocks of muttering pigeons which, on another day, might have taken wing. Today, the sky hung too low, too grey. It sat on the city like the snows of December, and the men on the bench felt its weight.

The bench—which was more than a bench—felt their weight, but was not depressed. They were its friends.

Two of them, old. Dying men in a dying town. Age and aloneness made their faces anonymous, replicated visages seen in a thousand parks of a hundred counties. O'Leary was the taller and the gaunter. Heavy steel braces locked his ankles in place, and let him shuffle on legs broken by one too many a loanshark. Schmidt dressed better, but he held his gloves in his hand and wouldn't button his topcoat. "For the imminent Ice Age," he explained. "This is the way I prepare. You should try it, Mr. O'Leary."

"Ah, Mr. Schmidt, it's a sure thing we'll be on ice of our own long before then."

They preferred the formality of titles, for all they'd liked each other these eight years past. Un-American, perhaps, but neither submitted to the dictates of the herd. They'd never been part of it, though even now they masked themselves with its masses. Neither desired attention. They valued dignity, discretion, a gentlemanly reticence—and found in each other what they could find nowhere else. O'Leary had been a gambler; Schmidt began as a mediocre physicist, then became...something else. O'Leary'd ridden his tiger into furtive retirement—Schmidt reached the New World in '38 and took a job driving dynamite trucks.

They didn't know even this much about each other: they shunned both self-pity and boasting. One's past, they agreed, was one's own—a necessary prologue, perhaps, but generally irrelevant to anyone else. This foible had shunted them through one metropolis after another, because only in the urban areas can a man with no history escape scrutiny.

During their daily sessions, they spoke more often of the present—the world's rather than their own—and most frequently of the future. When they spoke at all, for they shared silence as often as words. Yet still, each sensed in the other a capacity for recklessness, and this also had drawn them together.

And to the bench, though they didn't know it, for it was the most daring of all.

Schmidt fiddled with the fringes of his red cashmere scarf. "Into dust will the glaciers grind this city."

"How far south will they go, do you think?"

"Quite a ways; they did last time."

"Ah, but wouldn't it be grand, to stand atop the Terminal Tower and watch those great oceans of ice wash down out of Canada? I can hear them: snapping and snarling—gnashing on tenements with teeth of stone—their

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white skins crunchy under foot-padding wolves...God in Heaven, it would be a glorious sight."

As even a small glacier could pulverize the bench's cement, it disagreed.

A dozen teenagers interdribbled a basketball past them. "Youth," O'Leary said. "Speaking of which, Mr. Schmidt, when I was a boy—rest easy, man, this is not a nostalgic reminiscence—I believed that activity warmed one, and that inactivity of the type in which we wallow allowed winter's weight to sink into one's bones. It's a strange thing, though. I must have been wrong, for the truth of it is that I'm warmer after half an hour here than I was hobbling over."

Schmidt hunched forward, elbows on his knees. His blue eyes glittered under the brim of his grey hat. "Ja, I know chus—just what you mean. Perhaps the bench breaks the wind?"

O'Leary raised a silver eyebrow. "Let's have no vulgarities in public." He then pushed his glasses back up his nose.

"My apologies." At the curb, a bus clashed its gears, and he waited for it to move on. The disembarked passengers ignored him, as he did them. "Or, I'm thinking it could be our body heat? No, I'm silly, we don't produce enough, just the two of us sitting here alone."

As the bench had gone to some trouble to encase each man in an invisible and insubstantial insulating field, it resented Schmidt's assumption that they were alone. It also realized that it had done much to encourage that assumption, so it let it pass.

"I'm sure I know far too little to make an intelligent comment," said O'Leary. "It's a wondrous thing, and with your permission, I'll just sit here and wonder at it for a while."

"I think I'll join you."

Lovers hold hands and whisper; old friends sit back and let their thoughts roam. The couple cuddles to hasten closeness—friends know quiet isn't a cleaver.

Especially when they share a bench.

The plaza's saplings had given away their leaves, and O'Leary watched the wind play with them. *Like a child at Christmas,* he thought, *or a kitten blessed with a ball of yarn. It's a lie what they say about age—oh, the blood cools, passions flicker into embers—but if a man expects to rest after a full day, shouldn't he be delighted to do the same after a full life?*

Uncannily, Schmidt said, "It's good to have time to watch."

O'Leary was startled. "Did I speak aloud?"

"Pardon?"

"Nothing, nothing. You were saying?"

"The people on the street—" he waved his empty gloves at them, "—so busy. Running, thinking time is the enemy. They use their feet, not their eyes, which I have got to admit protects me because—" He chopped the thought off short. "They don't stop to watch a gull circle a buoy, or

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an ore-boat head home." He pointed in the other direction, out to where a long, flat ore-boat, empty and riding high, eased across the water like a self-extending line. It wanted to winter in Michigan, a real lake, not an out-spread puddle like Erie. "At these things I look, now, and I see how everything fits together, how all the attributes are owned in common but one has more and another less, and when watching, almost overwhelmed am I with this marvelous world where anything can happen and probably will, sooner or later."

O'Leary nodded. "It is more lovable when you're going with it than when you're fighting against it."

"Oh, ja. For sure, as they say on that one-eyed monster." He re-arranged his scarf, tucking it inside his topcoat. "My stomach growls, Mr. O'Leary, and that's something I have sworn never to fight." He patted his waistline, the discreet paunch beneath his vest. "So. I see you tomorrow?"

He put out his hand and let the other help him to his feet. Standing, it felt colder. "If it's not raining, I'll be here."

"Good, good." Slipping on his gloves, he bustled away.

O'Leary turned up his collar and headed home.

The bench said good-bye, but so softly that neither heard it.

The next day, O'Leary shuffled across the concrete plaza, joints stiff, legs sore. The breeze eddied in his hollow cheeks, and combed his sparse hair with cold fingers. He feld old, and trembly. The mailman had arrived forty-five minutes late—forty-five vulnerable minutes waiting in a drafty, stinking vestibule—than had gone away after leaving him nothing. He needed his bench.

But surprise slapped him: a stranger squatted in his old friend's place. He stopped, squinting through his dusty glasses. Red it was, a slick and shiny scarlet that screamed at the sullen-bellied clouds. *A man could burn himself on that,* he thought. Yet underneath the gloss...he winced. This was no stranger. It was his bench, rouged to the ears like a retired whore trying a comeback. *Ah, you poor thing, what have they done to you?*

"Mr. O'Leary!"

Awkwardly, he turned. The braces forced him to lift each foot and reposition his entire leg before setting it down again. The pigeons clucked to themselves and gave him room. "Ah," he said, when he'd maneuvered himself around, "Mr. Schmidt. Have you seen the desecration?"

Schmidt's round face was as red as his scarf. He slapped his gloves into the palm of his left hand. "Could anybody by this park pass and not see?"

"Vandals, do you think?"

"No. I saw them last night, after sundown. The Public V—Works Department."

"Same thing." He regarded it a while longer, and it saddened him. "Ah, if it weren't for the ache in my bones, I'd say 'The hell with it!' and

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find a park on which the city's ruinous hand has yet to light." He took a tentative step forward. "But it's a cold morning and I'm not so young as I was yesterday. Will you join me for a spell?"

Schmidt's ice-blue eyes flickered disdainfully across the bench. Then he shrugged. "So what else can a man do?" He took the thinner man's elbow. "Let me help you, Mr. O'Leary."

"Thank you, Mr. Schmidt," he grunted, lowering himself to the cold seat. Hands on his spread knees, he closed his eyes, yet the lacquer was a palpable presence, not so easily dismissed, and it glared at him.

Schmidt sat and rearranged his coat. "It feels different."

O'Leary laid one birdlike hand on the bench. "This generation has a fondness for plastic," he agreed. His swollen knuckles, legacies of a disputed deal, slipped across the cold fire, and lost heat instead of gaining it. "They sealed the pits that told its age."

"Ja." He bent over and peered between his feet. "The moss, too—just schlop, schlop, painted right over." He rubbed the slickness with a white finger. "Never on this stuff will it grow, the bastards." He shivered, buttoned his coat and pulled on his gloves. "But that is not my meaning."

"Would it be the absence of friendliness to which you refer?"

"Ja." He squirmed. "*Scheisskopfen*! Left and right they lay off people because the coffers are empty, then

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around they turn to despoil a perfectly good bench with five dollars worth of paint they could have spent on a book."

O'Leary nodded. A bus horn blared, and he jerked as though it were an alarm. All around strode people on their ways to places he'd never see; he wondered, as he craned his neck, if they were watching him. For the first time in eight years, he felt exposed, and turned his collar against the wind. Huddled within his coat, he tried to find something other than the bench about which to talk—he could sense Schmidt groping for a topic, too—he thought, *you silly old fool, there's no need to force a conversation*—but there was, because he was uncomfortable. Keeping his head still, he looked out the corners of his eyes—and found his old friend looking out the corners of *his* eyes. "Sch—" He cleared his throat, and wondered how the instinct had faded so quickly. "Mr. Schmidt," he began again, "something is very, very wrong here, and I was thinking that you, with your finely-honed mind—"

"—might have caused it?" bristled Schmidt, pushing himself to his feet.

Let him go, he's not worth it, said a part of his mind, but he pushed it into the background and caught at Schmidt's coat hem. "Please, sir, no! It's a different thing entirely I was thinking, though I apologize if I implied otherwise at the outset. Please, man, do sit down."

He sniffed. "V—well . . ." Then he shrugged. And sat.

"My thought is, you've a mind many a man would envy, and perhaps, if you applied that keenness to the problem at hand, you could calculate what it was that went astray when they outfitted our bench in these garish clothes. Are you game?"

Schmidt pursed his lips. And shrugged. "Why not? What else have I to do?"

"It's the paint's doing," offered O'Leary.

"Oh, ja—self-evident is it. The question is why?"

"Then—"

"Hush—let me concentrate."

So he sat back, and let his mind roam. Exhaust fumes browned the wind, stung his eyes. A light plane buzzed in from the west to land at Burke Lakefront Airport; a cloud of blasé gulls rose off the runway to let it through, then settled back down. His knuckles hurt. He remembered that night: it had been an honest deal, but the bruiser's cards had run rancid for hours and he'd consoled himself with bourbon. O'Leary'd flipped him a jack up, spades it was, and he'd checked; then a ten of the same suit and the scowl lightened and he'd seen the twenty the black man had bet; then a spade nine and the fifty flashed out quick indeed; but when the diamond six had fallen the bruiser erupted. Overturning the table, roaring, tossing off the Greek who'd tried to stop him, slamming O'Leary to the floor—and then the boots, thick-soled combat issue, crushed the innocent fingers, rising and falling again

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and again while he scrabbled to protect them . . . and it had been an honest deal.

Schmidt's voice jolted him into the present: "No good."

"By which you mean—?"

The pudgy man shrugged. "The theorizing is too abstruse. If we confine ourselves to observable fact, then we can say that the bench painted is less pleasing than the bench unpainted. No farther can I go."

"Then . . ." A slow grin rose to his lips. "If it's that simple, man, why there's a hardware store around the corner. As you'll provide the labor for walking, I'll provide the capital for working." He dug into his pants pocket. "A can of paint stripper, then—and a pair of brushes and scrapers, too."

Schmidt nodded, and something mischievous sparkled in his blue eyes. He took the crumpled twenty and stood. "But what," he asked, just before he left, "if a policeman interrupts us?"

O'Leary beamed. "It's the God's honest truth we'll tell him, Mr. Schmidt: we're just two concerned citizens trying to undo the damage that vandals have done."

"Oh, ja." He winked, and strode away.

The bench awakened as light warmed the first square foot of surface stripped. Greedy, its solar cells sucked up the radiation and switched on the sensors. The transmissions could wait until more power was available. In the meantime, it had to figure out what had happened to it. It had slept for an unprecedented length of time, which was very wrong. What had blocked the sun? It listened—then relaxed as it heard its old friends.

"A terrible smell this has," commented O'Leary, watching the red lacquer blister and crinkle under the thin film of paint remover.

"The clerk at the store said youngsters are sniffing it these days."

"Ah, youth."

"Ach, insanity, you mean."

"What the *hell* are you two doing?" snarled an unpleasant voice.

O'Leary straightened up, and turned his head. A burly, bearded man in a Public Works Department uniform stood behind them, hands on hips, dark eyes flashing rage. The skin of his cheekbones looked deadfish grey; his fingers had the same pallid cast. There was about him a sensation, an aura, that made O'Leary recoil, and want to sniff for rotten meat. It was like stumbling over a crocodile.

"C'mon, geezer," the man bit off. "Answer me."

He forced his face into impassivity. "And a good afternoon to you. As you can see, we're just repairing the damage—"

"I brought in a crew on overtime to paint that!" His hands ran through his wild hair. "Stop that!"

Eavesdropping eagerly, the bench began a series of voice analyses.

Schmidt, kneeling, made four rasping passes up and down its front. "Stop what?" he asked, not looking

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up. He shook the clumps of paint off his scraper and into the paper bag, then brushed more stripper on.

"You old fart, I said stop that!"

"Watch your tongue, young man," snapped O'Leary. He feared the man, though he didn't know why, and it called for considerable strength to add, "I'll not have you speaking to my friend Mr. Schmidt in that kind of language."

"You stay outta this, geezer. And gimme the paint remover before I call the cops." He took a menacing step forward.

O'Leary swallowed his fright. Something unnatural lurked here; if he pushed, he thought, he could make it show itself. "Please," he said. "Do call the police. We'll make an issue out of this—a first-class, front page donnybrook—and it will be interesting to see whether you retain your job. Imagine trying to justify paint for a concrete bench when the darlin' children are reading twenty year-old textbooks."

The bench applauded silently.

"I said gimme!" The big hand reached down.

Instinctively, Schmidt hugged his tools to his chest and jerked back, as if from a striking snake.

"You bastard!" He started to swing his boot, instead.

The cleansed panel of the benchface cracked wide; a beam of light—*(They would deny it, immediately, but each man saw fangs, pebbly green skin, an insectoid waist, and—behind that light-pierced beard—hate. Pure hate.)* —burst out, then *snap* it sealed itself.

"My God!" cried O'Leary, clutching the cement to steady himself. "What in the devil was that?"

Schmidt rubbed his eyes, and then blinked hard. "Lightning?"

He knew it for a lie—was even willing to let it pass as truth—but had to ask, "From our bench?"

"Oh, ja, well..." With a shudder, he pushed himself to his feet, and stumbled over an untidy pile. "Vas iss—what is this?" Bending, he picked up a boot.

"Our friend with the beard," said O'Leary shakily. "Or what's left of him."

Schmidt's face froze into the grimace it must have assumed when he'd steered a dynamite truck down a rain-slicked grade. Then he twitched it into a crooked smile. "Often have I heard that one can have the pants scared off him—" he held up a coverall; it was still zipped, "—but this is going perhaps too far, yes?"

"Down there." His finger trembled as he pointed to the mounds of unruly hair atop the other boot.

"A wig?" He shook it—untangled it—and displayed a bearded, hirsute head-and-face mask. "Mr. O'Leary, I think—"

"Rolled in newspaper, Mr. Schmidt, it would be invisible." He gestured to a sports page tumbling across the plaza. "No one would notice our carrying it away."

The pudgy man hesitated, then nodded. "Ja. Too much explaining

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would there be, otherwise."

The bench appreciated his wisdom.

O'Leary returned to his task—brush, scrape; brush, scrape—and with each stroke felt warmer. Less distinguishable. More among friends.

Schmidt tied the parcel, and wiped his hands on his topcoat. "Good progress we are making, yes? A second more . . . where could it have—"

"—from somewhere through which *I've* never traveled, or any man."

"Do you think it had colleagues?"

He stopped like he'd been sapped by a mugger. "Saints preserve us," he whispered. "Colleagues . . . Jesus, Mary, and Joseph . . . would *you* come down alone, man?"

They paused to stare at the sky, but the slate-bottomed clouds roofed them off from it.

"They would be up too high, anyway," muttered Schmidt, clamping his teeth.

"Most of them." With a tentative hand, he patted the bench.

Which admired his acumen, though it lamented his ignorance.

"It saved my life." Schmidt studied it for a moment, then shivered. "It's a better scouting method than we used, I suppose . . . but with all due respect, Mr. O'Leary, I have begun to doubt that we ourselves the foundations of our friendship laid."

"Mr. Schmidt," he said, "you are not alone in your doubt." He would have rambled on, to vent off the fear that swelled within him, but a pigeon fixed him with an oddly intent expression. It made him feel very, very self-conscious.

The instant its friends had exposed enough of its surface area, the bench began to transmit:

"The presence of Neralele on 186XT-3 is indisputable. It is also malignant, though the referees may consider this artifact's evidence biased, scanty, or both. For our purposes, however, we can treat it as established fact.

"This artifact has slain one, justifiably; the arena looms that much closer.

"Regrettably, two natives (informants 18A and 19C; see files) witnessed the dissolution of the Neralel agent. Intelligent, self-confident, and reasonably brave (see files 18A and 19C, subsections C: *Reasons for Cultivation),* they have deduced that neither this artifact nor the Neralel agent was indigenous to 186XT-3. They have obtained no further information.

"Request instruction."

Along East 9th walked the two old men—slowly, both to accommodate O'Leary's painwracked legs, and to give them breath for discussion. The crowds swirling past gave them room but not a second glance. Who cares about two senior citizens with a newspaper package?

"It's you who's been blessed with the brains, Mr. Schmidt. How do you analyze this situation?"

Schmidt shifted the parcel from right arm to left, then tapped his hat

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tighter onto his head. The fringes of his scarf fluttered in the wind. "I tell you, Mr. O'Leary, my head is too full of skitterings to with the necessary clearness concentrate on this problem. That said, I raise Point One: extraterrestrials are masquerading as humans. Where they're from, why they have come, what they plan to do —the faintest idea, even, I haven't got. Point Two: I think maybe you and me in all the world are the only ones who know, which, I have got to admit, has my knees knocking. If publicity they wanted, publicity they could have had, so I wonder what they will do to keep this thing uphushed. Ja? Point Three: for our own protection, someone in authority ought to know, and a bad idea it wouldn't be besides to sleep in new lodgings. Point Four: I have got no inkling whatsoever about how we can convince the government that it should lock *them* up and not us, because I tell you, Mr. O'Leary, if in we go and our story recount, a very strange look will we get. Unless I pull a string I should better leave untugged." Gloomily, he toe-nudged a beer bottle into the gutter. "Ach, such a mess!"

O'Leary nodded in wordless agreement. Overhead rumbled a 747 bound for Hopkins International; migrating geese pursued it. "It's a horrible thought that's just occurred to me, Mr. Schmidt, but have you stopped to ponder our bench?"

The shorter man tilted his head attentively. "Should I?"

"It might be in danger, you know."

Schmidt's eyes widened. "Ach, of course. I hadn't considered."

A traffic light held them on the corner while a crowd collected around them. They kept their voices low, though O'Leary had the feeling he could have shouted and attracted nothing more than a bored glance. "We have to protect it," he said.

"Naturally—it protected us. But how?"

He smiled. "Let's steal it." The light changed and he grasped Schmidt's shoulder. "You said you have a string? Come with me, man, and I'll elucidate my scheme."

The Neralel hive mind, disguised as a small iron-ore asteroid floating at the L5 position, wallowed in the sunlight while they analyzed the situation. Clearly, the Otogo probe had known their unit for what it was—otherwise it wouldn't have liquidated it. *Lone it,* they cursed. *We meant to keep the secret longer, to plant our seed deeper...*

The Otogo idiot had jeopardized forty years of infiltration by its untimely discovery. If it called in the referees...*nonsense*. They eased their panic with memories of multiplicity. *We have a perfect right to be here.*

And they could defend that right in the arena, to the satisfaction of the massed judges, both single and many —*if* the Otogo had no records of that furious, frustration-born kick...*lone that time-lag*...oh, they would win on the bloody gravel, but the law said,

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"To harm an aborigine is to be executed," and if the referees intervened, they would never reach that sun-baked coliseum.

Of course, if both prober and probees disappeared, no complaints could be made or proved...with deliberate haste, they dispatched their orders. They had no more units in Cleveland, but Pittsburgh, Columbus, and Detroit were close enough.

By morning there would be no problem.

"Well, Jee-zus," bellowed the Greek, a short, immensely fat man with black hair and three bodyguards. "Gimp O'Leary! When we didn't see you in Chicago no more, we figured you'd died or gone to Tucson or something."

"Sure and I am dead, Greek," said O'Leary wryly. "Don't you know Cleveland is hell?"

"I'd laugh more if I lived in Detroit."

"Wouldn't we all." He sat at the small table, and glanced around the restaurant, making sure no one but the Greek and his guards could overhear. "I've a favor to ask."

"The contract on you? Hell, Gimp, that was cancelled a long time ago."

"I hadn't known." He cocked his head. Self-effacement could end—if he wanted it to. "But no, it's your help for which I've come."

The Greek's face lost is jollity; he toyed with a salt shaker. "Gimp, times are hard, we ain't taking on—"

"No, no," he said impatiently, waving his hand like a word-cutter, "it's not that kind of favor I'm beseeching. I wouldn't be bothering you at all if there weren't a time factor, and I'll pay your men well. It's mildly illegal, but more of a prank, and I guarantee no one will notice, much less care."

The Greek scratched his third chin. "What do you need?"

"Two men and a crane."

Outside the restaurant, in the phone booth at the corner, Schmidt waited for his call to be answered. *Brrzz, brrzz, brr*—"Hello," said a deep, gravelly voice.

"Hans Dortendurf?"

"Yes, speaking. Who—"

"Is this the Hans Dortendurf who is Deputy Chief of Police?"

"Yes, who—"

"—*Sieg heil*, my long sleeper. This is your alarm clock."

Dortendurf's breathing stopped. Through the receiver creaked the sound of a heavy-set man dropping into a tired chair. Then, in a whisper, "For God's sakes, I was a *teenager* then." A pause followed—a long one. Then: "Thirty-five years ago it was finished, *kaput*—why—"

"I apologize, Herr Dortendurf, but I need you."

"Are you crazy?" rasped the whisper. "I'm an Americ—"

"This is not that, mein Herr. This is a threat to America, but such a bizarre threat that only through blackmail could I get someone to take me seriously. Come to 12 East 9th Street,

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Apartment 38, in—" he held his watch to the streetlight, "—three hours. Bring friends if you wish, but bring a gun as well. Be prepared to spend the night. *Danke.*" And he hung up, wiping his brow, angry that he'd had to awaken another man's nightmares, regretful that he'd just sacrificed his long-cultivated anonymity for what might turn out to be nothing but the hallucination of two old men.

O'Leary knocked on the booth's door. "Let's go," he said through the thick plexiglass.

The Otogo mother ship's message beamed in tight and terse:

"The referees have been on scene for weeks. Continue normal operations, but do not—repeat, do not—under any circumstances defend yourself. Acknowledge."

Resigned to the notion that it was a pawn in a greater player's gambit, the bench acknowledged.

And prepared for death.

The sun had set an hour earlier; the plaza, though lit by its own lamps and sprawled across the feet of a bright-windowed office building, was deserted. Except for the pigeons, which scattered in clucking flocks as the crane rolled across the flagstones.

While two of the Greek's men, dressed in day-glo orange Public Works Department coveralls, levered the bench up and crowbarred the crane's cables beneath it, O'Leary and Schmidt, clipboards in hand, stood to one side. "There's an old folks home on Superior," said O'Leary. "It strikes me as the kind of place our bench would relish."

"Ja, sure, but—" Schmidt tucked his scarf back inside his coat. "You are making it difficult for yourself to commune with it, yes? In such a place more likely will it be that others will claim it before you arrive."

O'Leary coughed into his cupped hand, and shuffled his heavy feet. "To speak the plain and simple truth, Mr. Schmidt, this climate's proving deleterious to my health. The thought had crossed my mind that Atlanta might be balmier."

The crane's engine purred; its cables hummed with tension. The bench tottered into the air. From the shadows emerged a black teenager. He looked around, then approached the men. "You dudes from the city?"

O'Leary waggled his clipboard. "Superintendents."

"Yeah? Well, what's happening here, man?"

O'Leary raised his eyebrows. "It's broken, of course. We have to take it back to the shop."

"No shit?" The crane released its load onto a flatbed truck; it thumped. "The shop? Man, you dudes are *weird.* See you around." And he sauntered off into the darkness.

Schmidt touched O'Leary's arm. "Could that be—"

"Who knows?" He tossed the clipboard into the truck. "Let's go."

The Neralele drifted into the plaza

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a calendar of upcoming events

2-4 November
NOVACON 9 (WEST) (Albany area SF conference) at The Turf Inn, Albany, N.Y. Guest of Honour—Bob Shaw, Fan Guest of Honour—Jack Cohen, Toastmaster—Wilson "Bob" Tucker. Art show, hucksters, banquet. Registration $10 until 15 October, $15 thereafter. Banquet, $10.50. Registration free for holders of U.K. or Eire passports. Info: Novacon 9 (West), P.O. Box 428, Latham NY 12110.

2-4 November
INTERVENTION (Intermountain area SF conference) at Ramada Inn, Salt Lake City, Utah. Guest of Honour—Orson Scott Card. Registration $1. Info: Intermountain Alpha, P.O. Box 15998, Salt Lake City UT 84115. 801-355-8076.

4-8 November
Auto-Carto IV International Symposium on Computer-Assisted Cartography at Reston, Va. Info: James A. Smith, Conference Management Branch, NCHS, Rm. 2-12, Center Bldg., 3700 West Highway, Hyattsville MD 20782.

9-11 November
ORYCON (Oregon SF conference) at Sheraton Portland Hotel, Lloyd Centre, Portland, Ore. Guest of Honour—John Varley, Non-participating Fan Guest of Honour—Richard E. Geis, Special Guests—Mildred Broxon, Steve Perry, Ursula K. LeGuin. Registration—$6 until 1 October, $8 thereafter. Info: OryCon, P.O. Box 985, Beaverton OR 97005.

29 August - 1 September 1980
NOREASCON TWO (38th World Science Fiction Convention) at Sheraton-Boston Hotel and Hynes Civic Auditorium, Boston, Masstts. Guests of Honour—Kate Wilhelm and Damon Knight, Fan Guest of Honour—Bruce Pelz, Toastmaster—Bob Silverberg. Registration $30 until 31 December 1979, non-attending membership $8 at all times. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition, the works. Join now and get to nominate and vote for the Hugo awards and the John W. Campbell Award for Best New Writer. Info: Noreascon 2, P.O. Box 46, MIT Branch Post Office, Cambridge MA 02139.

ANTHONY LEWIS

Items for the Calendar should be sent to the Editorial Offices, four **months** in advance of the issue in which you want the item to appear.

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around midnight, lacquer cans in hand. Quasi-independent because of the time-lag between Cleveland and the L5 position, they milled about when they noticed the bench had disappeared. Then one of them spotted the hand-painted sign weighed down with small rocks. He picked it up; it fluttered in the wind. Carrying it to a lamppost, he read:

"To the employers of the black-bearded man who was not a man: we can discuss the terms of our financial arrangement at 12 East 9th Street; Apartment 38. Sincerely, N. Schmidt."

They turned as one, and glided away.

The word small misstates the size of Schmidt's apartment. It measured twelve feet by fifteen, with an alcove for a kitchenette and a common john at the end of the hall. The oriental rug had muffled the floor's creaks for sixty years; the iron cot that sagged on it looked even older. One dirty window gave onto a fire escape; one light bulb burned in the high ceiling. Schmidt and Dortendurf sat on the bed. O'Leary, despite the pain in his legs, leaned against the window sill. In the alcove/kitchenette, behind drawn curtains, two uniformed patrolmen chatted away their ennui.

Dortendurf fumed, but quietly, lest the uniforms overhear. "I demand an explanation," he hissed.

"Demand as much as you like, mein Herr, but if I explained, out you would storm, sputtering that I am a silly old fool. All I will tell you is this: there will be an attempt to kill my friend O'Leary and myself, probably in the next few hours. If nothing by noon has happened, you can go home with my deepest apologies. If, however, you leave before then—" He shrugged. "There are documents . . ."

O'Leary listened with half an ear. Tired, he found it hard to stay awake, even standing. The poorly-heated room sapped his energy. The day had lasted forever. Normally he was asleep by this time. He shook his head firmly, and turned to look out the window.

On the fire escape, four pigeons huddled against the railings. The breeze, stiffer now, tossed their tail feathers from side to side. They looked cold.

"Mr. Schmidt," said O'Leary, "do you have any bread crusts I could feed to the birds?"

"Oh, ja. On the counter next to the sink in a brown paper bag."

"Thank you." He took two steps and—

The door few open.

Three tall, broad men with black hair and curly beards slipped inside. Each held a snub-nosed automatic. "Schmidt?" barked the one in the middle.

"Ja." He began to stand.

They raised their guns.

The curtain parted. "Hold it!" snapped a cop, drawing his own weapon.

Three heads turned as one.

"Freeze," he said, edging away from his partner. "Drop the pieces;

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get your hands up; and don't you move a—"

Two of them spun—blurred—leaped! And before either policeman could react, one lightning hand knocked his gun to the floor while another thrust an automatic into his gut. "Freeze!" said the two invaders, consciously sarcastic. And their voices were identical to the third's, who said, "Stand next to O'Leary, Schmidt. Tell your friend on the bed not to be stupid."

Schmidt laid his hand on Dortendurf's rigid shoulder. "Stay put," he said. "But thanks anyway." He stepped to O'Leary, who looked at the small gun in the large hand and thought of the hole it would tear through his body. *Jesus Mary and Joseph,* he thought. *I've done it now... Who'd have expected them to move that fast? A few seconds... I confess to Almighty God, to Blessed Mary ever Virgin—*

The big-knuckled hand began to squeeze—

Light broke through the window and flared around the three killers. (*Five men immediately refused to accept their eyes' reports—scales? fangs? vertically-slit pupils?*) Then the flash fled.

On the floor humped three piles of clothes.

On the fire escape, four referees snapped their wings and vanished into the night.

Dawn was ready to do its duty to the city, and pink clouds retreated from the horizon. The wind that blew, blew gentle, but smelled of snow and ice and white-breath days. It tumbled a black kerchief down the middle of Superior, then caught it up and threw it at a signpost. The kerchief masked the street name, and fluttered at the edges.

The bench warmed O'Leary's back, softened the pain in his legs. "Well, Mr. Schmidt, it's the parting of the ways that's come upon us."

"Ja," said the pudgy man glumly. "Too much attention have we attracted; this town is..." He shook his head. "You said Atlanta?"

"Possibly." Swallowing came with difficulty. "And you?"

"Strangely enough, Mr. O'Leary, I too was thinking of the Sunbelt... they say Peach Tree Street has some nice benches, ja?"

O'Leary smiled. "We've done our jobs."

"But from where—"

"Who knows? It's Dortendurf's problem now, the governments'."

"I would like to know the outcome, though," insisted Schmidt. "Look!" He pointed into the lightening sky, to a spot 60° away from the moon. Brilliance blossomed there briefly, like a miniature sun, then faded by imperceptible degrees. Three minutes later it was gone, completely, but the after-image lingered. "So much we don't know," sighed Schmidt at last.

The bench knew, but it wasn't telling.

It made sure they felt better, nonetheless. ■

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movers and shakers

Opportunities arise for strange reasons—because somebody's literal-minded, for instance.

THOMAS A. EASTON

I'm no great shakes. Not for looks. Not for smarts. I've never claimed otherwise. How could I? I make my nut with a battered pickup, moving furniture, junk, garbage, whatever folks'll hire me for. Maybe you've seen my ad: "Light Hauling. Cheap. Reliable. Call 382-5877." It's nothing much, but it feeds me and pays the rent. I'm not married, never have been. Never could find a girl who wanted much to do with me, but then that's one expense I haven't got.

But the alien didn't know all that. I thought. There he was, three feet high, sitting or standing or squatting, whatever he called it, on my doorstep. One squirmy looking finger, like an octopus' arm except it didn't have any

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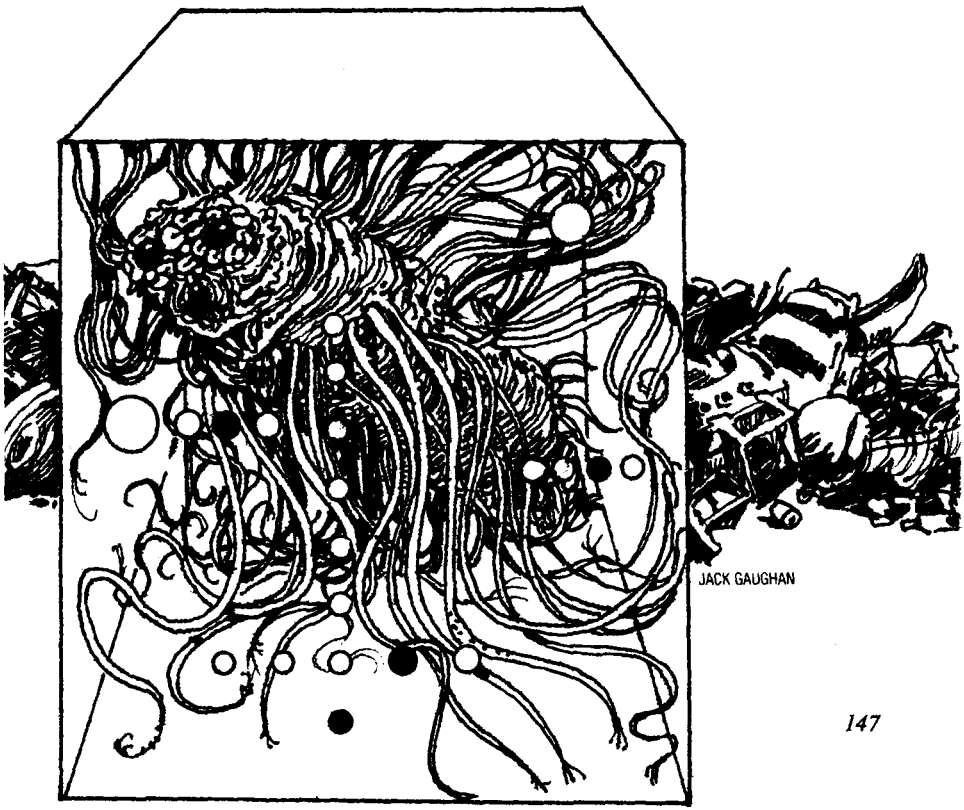
suckers, was still hanging in the air where the knocker had been until I opened the door. His eyes, black and wet, with no whites, were buried in folds of scaly skin. He looked like a cross between a fish and a squid. Smelled like one too. He sounded like—like God knows what. Think of an accordion that's been soaked for a month in molasses. That's not quite it, but it'll give you the flavor of it. His voice was slow and sticky, and it came out of a hole about where you'd expect a mouth to be.

The alien was saying something, but I wasn't hearing. I was staring. I'd read enough sci-fi to know this thing in front of me was an alien. It had to be, though blobs like this had been out of style since the thirties. And even then people had preferred aliens that looked at least vaguely human. Maybe I'd been drinking too much lately?

Too much booze in me or not, this thing was no hallucination. When I didn't answer him right away, he reached out and touched me on the chest with a finger. Or was it an arm? As far as I could see, it and fifty others just like it emerged directly from the creature's side.



JACK GAUGHAN

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That made them arms, right?

He touched me again, in the general neighborhood of the empty buttonhole over my navel. I stopped gaping and said, "What do you want?" Very intelligent of me, but then I told you I wasn't much on smarts. Besides, I wasn't altogether cool, calm, and collected at the moment.

"You are over your shock, yes? You have never seen my like before, but you can accept me, yes?" His wheeze was hard to listen to, but I could make it out. He was right, too. I could accept him, at least until he tried to crawl back into a bottle. I nodded vaguely and stepped aside. I waved him inside the door, gaping again when I saw how he moved. Like a centipede on all those arms. Or were they fingers? It really was better that he get inside out of sight. There was no telling what the neighbors would say if they saw him. Get me jugged, for sure. Keeping wild animals, dangerous pets, public nuisances, or something —if they didn't riot. It was a crummy neighborhood, but good enough so everyone could look down on me.

I closed the door behind him and followed him into the living room. Bedroom, too, for that matter, and kitchen. I sat down on the edge of the couch I used for a bed and waited for him to say something else.

"Call me Wirtz," he said.

"I'm Fordy." Then, thinking he might want something more formal, I added, "Sanford Randall. Though folks just call me Fordy."

"I know this. I also know you are illegitimate and have an IQ of 93. You are a virgin, an alcoholic, and a peeping tom. You shoplift, cheat on your taxes, and chisel more welfare than you deserve. You are also thirty-eight years old. I checked you out."

Speaking of peeping! And all I knew was that he was an ugly, nosy snob. I didn't like him much. "So what do you want?"

"I am a scholar. An experimental scholar. It is my calling to study primitive planets such as this one, to determine the quantal bits in their folklore and to cause the natives to act them out. I then record the results and publish them as holo films on my home world of Calaz. They are quite popular."

I didn't understand more than one word in three, but I got the idea. He was a meddler, like the anthrowhatevers who poke around the jungle gooks right here on Earth. He made money out of it too. Well, as long as a little of it rubbed off on me, he could study me all he wanted. "So where do I come in?" I said.

"These quantal bits—I have determined them already for your culture." A ripple ran through the boneless arms on one side of his body—his equivalent of a shrug?—and a slit opened in his skin. He reached in and pulled out what looked like a small sheet of paper. He held it up in front of his eyes and read aloud from it: "Penny pincher. Food for thought. Rubble rouser. Father knows best. Movers and shakers." He tucked the paper away again and went on. "That

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will do for a sample, yes. The last is you."

"Movers and shakers? You're going to make a mover and shaker out of me?" Fat chance! Like I said at the beginning. I'm no great shakes, and I know it. He'd have a better chance of making a silk purse out of a pig's ear.

"Not make one, no. You already are one. A mover because that is how you make your living, yes? And a Shaker because of your grandmother."

Oh, grandma. She turned Shaker about three years after she qualified as my grandma. Grandpa spent the next five years splitting his time between raising my mom, earning a living, and trying to convince her to come home. Then he divorced her and married again. All I could say was, "She makes me a Shaker too?"

"As much as anyone I could find who was a mover too. But now I must gain your cooperation. It is my understanding that movers and shakers become political leaders, found large corporations, or make great fortunes, and I cannot make you do any of those things. I need your help." That shrug again, but this time no pockets opened. Maybe he just didn't like admitting he couldn't do everything himself. Not that my help would be worth much. I'd never been able to make a fortune for myself, not that I hadn't wished hard enough.

I told him as much, adding that this called for a drink. I leaned over and fetched a bottle out from under the couch. Good booze. The last of a case I'd found squirreled away in a basement I was cleaning out two weeks ago. "Want any?"

"Ethanol agrees with me. We will drink to our partnership, yes?" I nodded at him and found a couple of glasses on the windowsill. I poured, and we both knocked the stuff back. He didn't have any more trouble with it than I did. He wasn't all that alien. He even liked it. His first words on getting the slug down were, "More, yes?"

I poured again, and we got down to business. He stretched out on the floor, on his back, those fifty-odd arms wiggling in the air except for the two that braced the glass on his chest. His head was between my feet, so that his eyes looked up at me whenever I looked down. I kept my eyes on my own glass as much as I could.

As soon as he was comfortable, he said, "Some ideas from you, yes? What do you wish to move and shake?"

I didn't have any use for politics, and—really—I was okay without gobs of money. It would just go for more booze, until I drowned in the stuff. But here he was, looking like a whole can of angle worms escaped from a fish factory. If I could just get him to run across the sidewalk when... "Well, there's this broad lives down the street..."

"The one you were watching three nights ago, yes?"

Yeahh! "That's right."

"No." He waved his glass at me. "More, please, yes." I poured. I gave

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myself a splash more while I was at it. "That is not what I mean. A mover and shaker affects the world, not individuals, yes? You need to have bigger plans."

Bigger plans. And I was pretty happy the way I was. But that wouldn't do. This alien, this Wirtz, he called himself, wanted to make something of me. I hadn't run into that since my mom died. "But I don't want that much," I said. "I've got about all I need right now."

He sighed, I swear it. Then he shrugged and opened another pocket. He reached in and pulled out a little sac. He opened the sac and spilled it out onto the floor beside him. I stared, even more than when I'd first seen him. Gold nuggets. Diamonds. Rubies. Jewels I'd never heard the names for. Small ones, though. Nothing big. Nothing flashy.

"First you will sell these. I have more if you need them, in my ship. Then you will buy some good clothes. Suits and shirts and shiny shoes, yes? More of this excellent ethanol, too. Then you will expand your business."

I must have looked blank, for he sighed again. "You collect garbage, yes? So you will buy a real garbage truck." And he laid it out. He had it all figured. He would make me the garbage king of the county, even the state. First the clothes, to make me look like a prosperous business man. Then the truck, business loans, more trucks, drivers, until I was a goddam monopolist. And then I'd bid to handle the city landfill, cheap, bring in sorting equipment, and start selling scrap metal, glass, and so on. The perfect garbage operation. No dump problem, total recycling, and we could even process the garbage that had already been buried. All I needed was him to steer me along and his diamonds to finance it all.

By now the bottle was almost empty and my head was whirling, more from Wirtz than the booze. I'd had less than half the bottle. Considerably less. He'd had the rest. So I agreed. I'd go along. I'd stooge for him, and I wouldn't have any illusions about it all. He'd really wanted my ideas? Don't make me laugh!

It went just the way he'd laid it out. I sold a small diamond to a fence I knew, no questions, bought the clothes, and took the rest of the sparklers to a legit jeweler in another town. Got a good price that way. Bought the truck then, hired a man, and spent my time bidding cheap on restaurant contracts. Got enough of them so I needed more trucks and talked the bank into buying them. Had the city monopoly in a year, took over the landfill, and that was when Wirtz crawled out from under my couch, where he'd been boozing it up all along. He'd only come out for a fresh bottle or to hand me some more of his jewels.

Now, though, he wanted to take a real hand in the operation. He had me get a big pet carrier, one of those plastic-covered masonite boxes with a window in one end, and take him out

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to the landfill. Once we were there, he had me carry him around and show him the joint. That was a chore! The place was an old gravel pit, a hole in the ground most of a quarter mile across, half of it filled in with everybody's leavings. I bitched at having to lug him around, but he just said, "Do you want people to see me, no?" No way! I had the money now, but I still hadn't moved. Too much trouble. So the neighbors could still riot.

He didn't explain himself until we'd covered the ground twice. Then he told me, "You will set up the sorting machines over there, where there is no garbage yet. Then you will only need a conveyer to get what has already been buried."

And that's the way it was. I had to have a road bulldozed for the trucks, so they could get around to the back of the landfill pile, and I had to have foundations built for the machinery. But within six months I was all set up; godawful great hoppers that fed the garbage to a shredder, magnets that yanked out the iron and steel, air blowers that separated out the paper and other light crap, shaking screens that sifted out the crushed glass, and a baler for the bits of copper wire, aluminum tubing, and the like that came out at the end. I took one look at the finished noise-maker and named my outfit "Movers and Shakers, Inc." Wirtz had done it, alright. That's what I was. And I had more money than I'd ever dreamed existed. I got paid for picking up the garbage, and then I turned around and sold it again. The paper went to a paper company. The glass went to a bottle maker. The metal went to a scrap metal dealer. A healthy profit on every ton, and more going out than my trucks were hauling in, at least until I'd finished sorting out the fifteen years worth of garbage that was buried behind the shredder.

That was when Wirtz came out from under the couch again. He said he was bored. He wanted something to do, yes. And it was time to start recording how I was acting out the folklore quantum he had assigned me. He wanted a control room, set up right over the conveyer that brought the stuff out of the landfill. He wanted to be able to start or stop the whole show, or any part of it. He also wanted a grab-arm, like on a pulp truck, so he could pick things out of the garbage stream. As he put it, "There is no sense in letting a rock get into the crusher, yes?"

How could I argue? That machinery was expensive. He got his control room, an air-conditioned metal box, four by four by four, with one window looking straight down on the conveyer. How he expected to make movies that way, I didn't know, but that was what he wanted and it was none of my business anyway. Maybe he had a camera that could see through walls. That would explain how he'd known so much about me.

As long as I knew him after that, he stayed in that box. I brought him booze and food, whatever he asked for, and let him shut the conveyer

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down when he wanted to sleep. I hung around in the evenings, too, just to talk the way we had when he was living under my couch. I told him how things were going, how other towns were beginning to copy our setup, how the power company was talking about building a small plant near us to burn the paper and other combustibles we sorted out. If they did, we'd get a better price. Coal was more valuable than wood pulp, and that's what we'd be competing with. I bitched about all the paperwork too. I said I wanted to hire a lawyer to handle it for us. He said no. I should do it myself. It was good for me, yes? He sounded just like my mom.

I must have messed up the paperwork, though, because it wasn't long before we had an OSHA inspector checking us out. He looked at everything, talked to the employees, and filled out wads of forms. When he was done, he ticked me off for not having seat belts in the trucks, not having a railing around the shredder, not this, and not that. He said if I didn't make the place safer, I'd be paying fines, so much a day until I was "in compliance."

And then he asked me what that box over the conveyer was. So what could I do? I told him. "It's a control room."

"Not that small, it isn't. Unless you're violating the child labor laws too." He was a smartass, he was. But then weren't they all?

"No kids," I protested. And then I put my foot in it. "No midgets or dwarfs, either."

"So who runs it? I don't see you paying anyone enough to squeeze himself in there." He paused for a moment. Then he hauled his sheaf of forms out of his pocket again and said, "Maybe you'd better let me have a look inside."

I backed off, quick. "Why bother? It's just machinery inside, you know? Automated." Oh boy! I didn't want him seeing Wirtz. Not at all. He was trouble enough already, and I sure didn't want the feds walking off with my diamond supply. They would, too, if they realized what it was.

But he insisted. "I see a door. Open it up."

So I did. I didn't say another word while we walked the few yards across to Wirtz's little metal box. I led him right up to the door and opened it. And when he turned white I was too busy laughing to pay much attention to Wirtz's look of surprise. "What is it?" he gasped.

"It's a sea cucumber." I crossed my fingers.

"The hell it is." He straightened up, the color coming back to his face. I closed the door again. Wirtz would have to wait for an explanation. "The hell it is."

"Sure it is. I caught him off Cape Cod. Trained him to spot rocks and keep them out of the shredder."

"The hell you did. That's no sea... that's... not that big. Not with all those legs."

"So you tell me. Maybe I don't know a sea cucumber from a sea cab-

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bage. Anyway, it's a trained animal." If he would swallow that, I was okay. The worst he could do was sic the SPCA on me.

"Yeah. A trained animal." He shook his head. I could see he didn't know what to think. Fumes from all the garbage, maybe? He'd probably wind up passing the buck to his boss, but it would be a few days before he got back to the office. We had a little time anyway.

As I walked him back out to the parking lot, I heard the conveyer speed up. Wirtz had probably heard it all, the damn peeper, but why should he be in a hurry now? Speeding up his cameras wouldn't get him done and out of the way any faster. Besides, the conveyer wasn't a camera.

Once I was rid of the snoop, I headed back to Wirtz as fast as I could, but it didn't do me any good. He was hunched over his window, staring down at the garbage zipping by on the conveyer twice as fast as usual. He was concentrating so hard I don't think he even heard me shouting at him. So I just watched, while he touched controls to speed up the shredder to keep up with the conveyer and the sorters to keep up with the shredder. By then I couldn't hear myself think, much less shout, so I headed back to the office: soundproofed, thank God.

Wirtz was more of a puzzle than I'd ever stopped to think. It had taken the OSHA guy to show me that. If I wasn't a boozer from way back, I might haved reacted like him the day Wirtz showed up on my doorstep. But

OOPS!

As you've probably noticed, some of our recent issues—especially August—have contained more than their fair share of errors. We must, for example, apologize to Edward Wood for omitting his by-line from the Reference Library, and point out that he is well aware that the misattributed cover he mentions was for *Planet Stories*, not *Plant Stories*. In Thomas A. Easton's article, "Is the Universe a Yo-yo?", were several mistakes severe enough to need correction for those readers interested in getting the true sense of the article:

On p.48, column 2,4 lines from bottom, "destiny" should be "density".

On p.51, column 1, after 10th line from bottom, insert, "hole is called the black hole's event horizon—black".

On p.52, column 2, 3rd line of last paragraph, insert, ", and that frustrates us. How can the beginning".

There were an embarrassing number of others scattered through the issue in addition to those I've mentioned.

How did this happen? An unfortunate combination of factors, including personnel changes in this office occurring at roughly the same time as major changes in our physical production methods. Hopefully, all that has now stabilized and the new system is settling down to smooth operation.

Meanwhile, our sincere apologies to any authors whose work contained errors, and to any readers whose enjoyment was marred by them.

And, of course, our promise of every effort to see that it doesn't happen again.

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I didn't. And now look at me. A businessman. An industrialist, yet. Getting rich, even. It was like having a fairy godmother. But how long was it going to last? Wirtz was in a hurry now, which meant he intended or hoped to be done soon, probably before the snoops came back. I had to wonder if I could hack it without him. I certainly never had before.

As it turned out, it was a good two weeks before the feds came back, and by then the control room was a comfortable ten by twelve by eight, occupied by a college kid picking up a little cash for the fall. Wirtz, you see, had been done in ten days.

Four or five days before the feds showed up again, I came to work and found the place quiet. Shut down. Nothing running. Piles of garbage beside the hoppers where the trucks had dumped their loads. And the door to the control room wide open.

I walked—walked, hell, I ran—over to ask Wirtz what he was up to. Was he molting or something? But I never got a chance to open my mouth. The control room was empty. Wirtz was gone. In his place, lying on the control room floor beside the window, was a piece of paper.

It was an apology. Wirtz, it seemed, was no scholar. He was a shipwreck. He'd been cruising over town one night when a piece of his engine fell off. It wasn't much, just a little doohickey that looked like a piece of twisted pipe and let him get home in a month instead of a century, so he had been able to land safely and hide his ship. But when he went looking for the doohickey, he couldn't find it. It was moving through the city, his instruments told him, faster than he could move without his ship. He caught up with it when it stopped moving, though, and found it buried under ten feet of garbage and fill, well beyond his solitary reach. So he had found me and set things up so he could search the whole dam landfill if he had to. And he had finally found his doohickey. Now he was on his way home, but he'd be back. And I should have a bottle waiting.

I laughed. I'd been had, conned by a friendly little boozer just my style. I looked forward to seeing him again. In the meantime, I was off my uppers for a change. I'd gotten as much out of it as he had. And I could get a little more, too, if I could just get on the stick and get that control room replaced in time.

It took two days and a lot of overtime to get the new structure built. Two-by-fours and plywood and tarpaper. The same air conditioner. The same controls, though with bigger handles. Windows in the walls in addition to the one in the floor. And it was worth it. When the OSHA guy came back, he was totally confused. Had he been seeing things? I could see the answer in his buddies' faces: he must have, with the story he'd been telling, and he wouldn't have his job all that much longer.

I'd been had, sure, but so had he. I'd passed it on, and that's what makes life bearable. ■

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sensory deprivation

THE ALTERNATE VIEW

by G. HARRY STINE

I have just completed a rather unique, harrowing and often frightening psychological experience.

Normally, I won't belabor you with personal experiences and will try to stick strictly to nuts-and-bolts science reporting. However, my personal experience in this case amounts to that and gave me some insight into the trials and tribulations of the pilot of a space vehicle. I've always been interested in the human angle of astronautics, especially the *similarities* between things we have been doing for eons and the things we are going to be doing, often for the first time, in space. For example, I knew very well that there would be few human problems involved with achieving orbital rendezvous and docking of space vehicles; I have successfully docked a 300-pound row boat with a thirty-foot yawl in Long Island Sound without even a scratch, and I have watched the commander of the 24,294-ton S.S. *Statendam* gently ease that huge vessel into a berth.

Now I have experienced something else that has given me more insight into piloting a space vehicle.

I have had to control a vehicle in three-dimensional space, maintaining its performance within strictly limited boundaries, all while in a situation of extreme sensory deprivation. I was deprived of visual inputs and cues directly from the outside world. I had to totally disregard the signals from my otoliths—the semicircular canals of my inner ear that sense rate-of-change of motion in three dimensions—and the kinesthetic cues that were coming from the seat of my pants. The only information about the outside world and my relationship to it came to me through instruments that did not provide a one-to-one analog representation of the situation but required considerable mental interpretation. I was also given auditory commands relating to performance. Additional information was provided to me visually in the form of cryptic marks and designs printed on sheets of paper: maps and charts.

If I had not correctly interpreted all of this alien type of information, I would have become very dead.

Yet I did it because it was a challenge, because thousands of other

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ordinary people have successfully done it, and because it was probably the very best form of life insurance obtainable.

I am now a licensed airplane pilot fully qualified to fly under "blind" or instrument conditions. Every airline transport pilot does this every day as part of his professional activity. But I found that instrument flying went far beyond the mundane matter of getting from Point A to Point B while surrounded by milky-white clouds; it had a distinctly science fiction flavor to it.

A lot of us have written blithely about Our Hero piloting the *Star Ship Intractible* through the uncharted wastes of a globular cluster in order to Save The Galaxy from a death worse than fate . . . or some such. So Our Hero has a Lot On His Mind.

The chances are better than 50-50 that Our Hero is going to end up spread thinly over the surface of a planetoid.

I have learned that when an individual is subjected to the sensory deprivation of loss of immediate visual cues from his surroundings in addition to loss of tactile or kinesthetic cues from gravity or acceleration, and when he is dependent upon the technology of instrumentation for his very life, he is under the most incredible mental and physical stress imaginable. It requires one's total and complete attention to the gauges.

It is also abundantly clear to me exactly why nearly all the astronauts and cosmonauts to date—with few exceptions, and most of those because they were and are unusual people—have been highly-disciplined and highly-trained experimental jet test pilots with extensive experience in flying the hottest and most dangerous transportation devices under these conditions of sensory deprivation. Furthermore, they maintain their proficiency in this activity by continuing to fly hot, fast, and dangerous aircraft.

You simply cannot take a person off the street, no matter how good the person is, and expect performance under conditions of sensory deprivation. The internal discipline isn't there.

Arboreal monkeys would make better space pilots because they are three-dimensional creatures. Human beings are not. Our remote ancestors deserted the trees and ventured forth into the savannah where game was more plentiful. We became two-dimensional creatures and retained three-dimensional senses because leopards jumping out of trees eliminated those proto-humans who didn't have those senses.

All of us have been born and raised on the surface of Planet Earth at the bottom of a very strong gravity field that gives us a very distorted notion of the Universe. Evolution has also armed us with senses, and we have learned that we neglect the inputs from those senses at our peril. Deep down in our minds, we do not really trust the gauges; we would rather "wing it" on gut feeling. That's why an airline transport pilot with 10,000 hours in his logbook manages to fly an airplane into the side of a mountain. It is why Frank Tallman, the Grand Old Man of movie stunt flying, flew a

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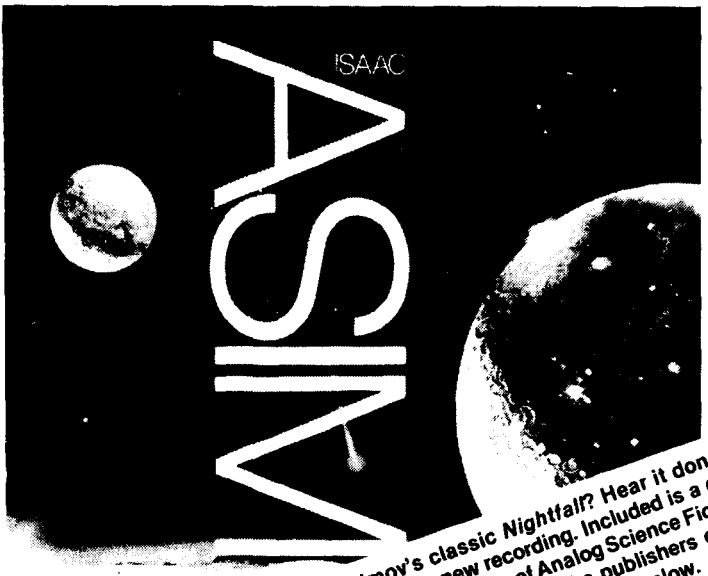
fully-equipped modern airplane into a 3000-foot ridge practically in his own backyard. And it is also why some technician shrugged at the reading of the gauges at Three Mile Island. Therefore, the best space pilots have yet to be born and we can't expect that there will be any really "natural-born" ones around until 2025 or later. Reason: they will be born in space and will have learned from their earliest childhood how to be three-dimensional



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beings in weightlessness. They will be able to do naturally and fearlessly what we two-dimensional Earthlings can only do after undergoing the rigors and the terror of learning instrument flying techniques. And, even then, it will be work because you've got to turn off your cerebellum and operate totally with your cerebrum. There is always an inward terror that never surfaces unless Our Hero succumbs to vertigo . . . which is a situation of total and complete disorientation that has to be experienced to be believed. For a long time to come, operating a vehicle in three-dimensional space will be hard work, requiring every erg of mental energy you possess and demanding that you shut out personal problems. If you do not, you will do an arse-over-teakettle Darth Vader Exit . . . or worse.

Yes, there are autopilots and guidance systems. They are helpful. Even today's autopilots will bring a Douglas DC-10 in for a completely automatic Category III landing . . . if something doesn't go wrong. Why do you think there are still three highly-qualified people riding on that flight deck engaged in constant monitoring and ready to assume complete command in a split second? As the machinist complained about the numerically-controlled automatic milling machine, "But the automatic stop didn't stop!" To which the shop foreman rightly responds, "Well, why weren't you watching the automatic stop?" Now you know why policemen carry revolvers rather than Colt automatics; running an automatic device requires your full attention! In space, things are going along nicely until a solar proton goes *zing* through the VLSI of the autopilot and maybe wipes out a couple of gates. Better be standing by to take over manually, buddy! Trust an automatic machine only as long as it is working, be prepared for it to quit, and get yourself into the loop as quickly as possible once it does quit. And you'd better have the personal discipline and long training necessary to do it by hand under conditions of incomplete or unusual data inputs resulting from sensory deprivation.

Ah, but when everything really works, it's beautiful! It gives one considerable confidence in the human mind's ability to come up with systems that can compensate for sensory deprivation when you break through the bottom of a solid overcast with all needles centered to see the runway approach lights dead-nuts ahead and the runway disappearing into the fog a half-mile down its length. You made it, and all those instruments were right after all! I can understand the jubilation in the voices of the twelve astronauts who first landed on the moon or the excitement in their tone as they achieved a perfect docking in orbit.

We can learn to operate with sensory deprivation. We can learn to suppress those ancient instincts and all those previously-learned responses! We do have the capability to be three-dimensional beings in the Universe!

But it isn't easy, and it won't be easy for a long time yet. ■

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(continued from page 10)
They could produce motion of a separate body at a distance with no direct, mechanical connection or means of transmission of the force between the bodies. This bothered the physicists of the 19th Century because, in their minds, there had to be a medium through which force could be transmitted to produce action at a distance. And the real nature of light bothered them, even though Newton had come up with some basic working principles of light; light could be considered as either waves or particles. But the wave theory required a medium of transmission through space. To solve their dilemma, the 19th Century physicists gave birth to the concept of the "luminiferous ether," a general property of all space that permitted the transmission of light waves and the force of electric and magnetic fields. The luminiferous ether was a perfectly rational "operator" or concept permitting operation. It certainly was no more irrational than some of the concepts of today's physics. . .as we will see.

The first great break with Newton's mechanistic Universe came from a Scots Professor of Mathematics at Aberdeen University, James Clerk Maxwell. As a result of the work of Michael Faraday, the founder of the field of electrodynamics, Maxwell became profoundly interested in evolving the mathematical expressions for the electric and magnetic fields of Faraday's work. In his 1873 *Treatise on Electricity and Magnetism*, Maxwell developed the pervasive equations of electromagnetics that still bear his name and tied together the phenomena of electricity, magnetism, and light. He hypothesized that light and electromagnetism were the same in their ultimate nature and developed a series of equations describing the electromagnetic field. To account for energy that apparently left an electromagnetic system when electrically-charged particles were accelerated, Maxwell postulated electromagnetic radiation that was similar to but differed in frequency from light radiation. Electromagnetic radiation, Maxwell proposed, travelled through the luminiferous ether with the velocity of light.

Unlike Newton, Maxwell proceeded on the basis of pure intuition using the tool of mathematics, his work predicting phenomena that had not yet been observed or measured.

If Newton did indeed come up with the concept of the Law of Gravity according to the unlikely story of the falling apple, it must be said that Faraday was a man who looked at a common magnet and saw the miracle of electric power while Maxwell, on the other hand, wrote a series of equations that unerringly predicted radio, radar, and television.

In 1880, Dr. Albert Abraham Michelson performed the pioneer experiment to measure the speed of light and determined that it travelled through air at a speed of about 300,000 kilometers per second. He was followed in 1886 by Heinrich Rudolph Hertz who performed his

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critical and elegant experiment on electromagnetic radiation, confirming that the speed of electromagnetic radiation was the same as that of light.

Here was a whole new aspect of the Universe that had been unknown to Newton. Within a few years, it was further disrupted by Becquerel, Roentgen, and the Curies with totally new and formerly unsuspected types of radiant energy.

How could the new discoveries of electromagnetic radiation be shoehorned into the Newtonian Universe? What new theories could be developed to account for the new phenomena as well as for the vindicated principles of Newtonian physics?

Many would have us believe that Albert Einstein appeared at this juncture, developed the Special Theory of Relativity, published it in 1905, and set the Universe right again to the immediate acclaim of his colleagues. Such was not the case.

Albert Einstein was another highly intuitive thinker as Maxwell had been, a man with a mind that prowled. He had both the time and the opportunity to read widely, and he did. He was profoundly influenced by the work of Ernst Mach who had published a thorough critique of Newtonian physics in light of the new discoveries in electromagnetism. In common with many other great leaps in human understanding, several people came to similar conclusions within a time span of a few decades, and it is probably unfair to claim that Einstein knew of these. Henri Poincare worked out the mathematics of special relativity before Einstein; Herman Minkowski had developed the space-time viewpoints that are the cornerstones of special relativity; and David Hilbert derived the field equations of general relativity...all of this quite independent of Einstein.

But it took Einstein to synthesize these concepts and present them to the scientific Keepers of the Faith of those days in such a manner that they did not feel threatened. Einstein's first papers were innocuous and gentle extrapolations based on the work of Maxwell; they concerned themselves with the electrodynamics of a moving charge. By the time Einstein got around to presenting his Theory of Special Relativity in 1905, he had gained such a high reputation as a theoretical physicist that few people were willing or capable of giving him argument.

And it was exceedingly difficult to poke holes in a theory that so rationally explained the puzzling results of the Michelson-Morley experiment.

In 1887, Dr. Albert Abraham Michelson and Edward Williams Morley performed a simple experiment seeking to confirm the existence of the luminiferous ether. Using an interferometer, they measured the speed of light coming in from space in the direction of Earth's orbital motion and the speed of light in the opposite direction. Because of the Earth's orbital speed around the sun of 30 kilometers per second, the experiment was expected to yield a result of 60 kil-

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ometers per second difference in the speed of light from opposite directions. This sort of thing can be easily measured with a interferometer.

Many scientists will tell you that (a) the results of the Michelson-Morley experiment triggered Einstein to begin working on the Special Theory of Relativity, and (b) that the Michelson-Morley experiment showed no difference in the speed of light reaching the Earth from any direction.

This is not correct.

Albert Einstein publicly stated that the Michelson-Morley experimental results "had no role in the foundation of the theory."

And, while it is true that Michelson and Morley did not find the expected 60 kilometer per second differential that would have confirmed the existence of the luminiferous ether, *they did find a difference of about 8 kilometers per second!*

Physicists do not like to talk about this, if they know about it.

And it is not an isolated piece of data. Dr. D. C. Miller, once president of the American Physical Society, performed the Michelson-Morley experiment more than 25,000 times between 1902 and 1926. The results were the same, even with better equipment. He announced his results in his presidential address before the American Physical Society on December 29, 1925.

This announcement from a respected scientist of high reputation and great integrity should have aroused considerable interest among his colleagues. It didn't.

This data should have caused physicists to question the Special Theory of Relativity and to attempt modifications of the theory to account for the observed data. It didn't.

They ignored it then, and they ignore it yet today.

W. Kantor at the U.S. Naval Electronics Laboratory tried the experiment again in the late 1940's and confirmed the apparent fact that the speed of light is not independent of the motion of the observer!

The Special Theory of Relativity of 1905 postulates that the speed of light is independent of the motion of the observer and will always be the same in any direction. Nearly all physicists have completely closed their minds to anything that even *slightly* threatens their tidy but increasingly messy rationale of the Universe that they have derived from the two theories of relativity. In 1958, M. Polanyi wrote, "Little attention was paid to the experiments, the evidence being set aside in the hope that they would one day turn out to be wrong."

Well, they haven't. Several relativistic physicists have attempted to explain away the 8 kilometers per second. Their logic and rationale remind one of medieval bishops trying to prove how many angels could dance on the head of a pin.

Why hasn't somebody re-checked it recently and told the world about it? Number One: Try getting the funds to try it. Number Two: Try getting the results published. In 1965, a colleague

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who is an outstanding physicist was flatly told by the editor of a prominent journal that there would be no consideration of publication given to *any* material that offered *any* contradiction to relative physics. I have also been involved in some work that indicated that the theories of relativity could be considered as a special case of a more general theory, and one of my associates was privately told by the director of a well-known research laboratory that it was to be hoped that the results of the work would never be published. Never mind what the work was, and never mind who said what to whom because that is immaterial. I am not a crackpot out to sell a sweeping new theory of the Universe. I simply know why and how controversial material is denied publication by the Keepers of the Faith. And now you know why they have been called the Keepers of the Faith herein.

But one certainly knows how both Gallileo and Copernicus must have felt . . . . And one would suspect that even Albert himself rests uneasily.

Three key experiments were used to vindicate the theories of relativity. The first of these was the Michelson-Morley experiment which purported to verify that the speed of light is independent of the motion of the observer . . . which it did not exactly do. The second was an explanation of some anomalies in the orbit of the planet Mercury, before it was discovered that Mercury orbits deep within the measurable atmosphere of the sun under the buffeting of the solar wind; the perihelion shift of its orbit can now be adequately explained by several hypotheses . . . which are rather buried in obscure corners of the literature. The third experiment "confirmed" the postulate that light is bent in the presence of mass due to the warping of space; British astronomers attempted to confirm this during an eclipse of the sun in 1919, followed by an American team in 1922. The displacement of stellar images near the edge of the solar disc suffers from two interesting problems: (a) the German astronomer Soldner came to the same conclusions using the corpuscular theory of light *in 1805,* and (b) the confirmation of relativity works if you carefully select the stars whose images were displaced!

But the relativists charged gaily ahead, and the *Alice In Wonderland* appearance of modern physics is a result, especially in the morass of proliferating sub-nuclear particles such as muons, leptons, and perhaps even someday lemons and demons to permit the Keepers of the Faith to completely fill the pantheon. These particles possess unusual characteristics—charm, flavor, color, hue, strangeness, and perhaps even someday sexiness or loveliness just to add to the beauty of the Universe. All of these particles and their characteristics were discovered by first slamming particle against particle or particle against target at exceedingly high speeds and with incredibly high rates-of-change of acceleration or jolt. The resulting debris leaves trails in various media by

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virtue of their energies, and their masses are determined by accelerating them in a magnetic field. Physicists—or more properly laboratory assistants or graduate students—must look pretty hard to find some of these wild and wonderful particles. In the search for one such new particle, they had to search through more than 100,000 photos of particle tracks in a bubble chamber in order to find the *one track* that satisfied their prognostication. (And then they have the audacity to claim that Dr. J. B. Rhine at Duke University was guilty of selecting the data in his ESP experiments!)

The General Theory of Relativity published in 1915 predicted the existence of gravitational radiation as a consequence of the acceleration of a gravitational mass. Einstein really wasn't satisfied with it, and the gravitational radiation anticipated was rather feeble, to put it mildly. For more than sixty years, physicists have been searching in vain for relativistic gravitational radiation, and the field is in greater disarray than ever. The pioneering work of Dr. Joseph Weber at the University of Maryland produced questionable results that nobody has been able to confirm; relativistic gravitational waves would be so feeble that the ripple caused by a gravity wave passing through a multi-ton block of metal would be below the noise level generated by the thermal movement of the block's own atoms!

As recently as February 8, 1979, astronomers J. H. Taylor, L. A. Fowler, and P. M. McCulloch reported "quantitative confirmation of the existence of gravitational radiation at the level predicted by general relativity" in measurements of the only radio pulsar known to be part of a binary

In times to come

● In December, as promised last month, Roger Arnold and Donald Kingsbury complete the introduction of their concept of a giant orbiting spaceport to make space travel cheap. "The Spaceport: Part II" explores some of the possibilities such a spaceport would open up, including the extraction of lots of energy from moon rock. Just by virtue of its position at the top of a deep gravitational well, you know, it has a lot to give. . . .

If the Arnold-Kingsbury spaceport is ever built, it will be the seed crystal for the growth of a whole new kind of world, but still inhabited by the same diversity of ordinary and unordinary people who have always made up humanity. You'll meet some of them in Donald Kingsbury's lead novelette in the same issue, *The Moon Goddess and the Son*, wherein one, in particular, works from inauspicious beginnings to carve herself a niche in the new world. You probably have some pretty good ideas of why civilization, in the abstract, will expand into space, but the reasons for *individuals* going will be as varied as the individuals themselves. Vincent DiFate's cover shows the spaceport in action. Interiors are by James Odbert.

Clifford D. Simak's *The Visitors* also reaches its conclusion next month—a conclusion I doubt you've anticipated. And, of course, we'll have a variety of short stories and the usual departments.

Incidentally, please note that next month wraps up the 1979 Analog year. That means it's almost time for the annual Analytical Laboratory, so you might start thinking over your preferences from the last dozen issues. We'll try to slip in a reminder and voting instructions next month—and maybe some sneak previews of what you can expect in 1980, which marks the Fiftieth Anniversary of *Astounding/Analog*.

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star system (PSR1913+16). Within weeks, their results were challenged by other relativists claiming the formula used was an approximation and that the mathematical complexities of the theory left some doubt about the accuracy of the calculation....

All of the above is true, and all of the above should provide anyone with an insight into the state of modern physics. There is conflicting data that isn't admitted as data. There is data swept under the rug because it doesn't jibe with the current dogma. There is slippery logic and even slipperier conclusions. There is infighting and politics. There are men on horseback charging off in all directions. There are even such insanities as "just slightly broken laws of conservation of energy." It was almost as bad more than a quarter of a century ago when I got a small piece of paper that proclaims that I majored in physics and that I am now looking at as I write this. Fortunately, I do not have a scientific reputation to uphold along with several grants and tenure to worry about; so I can write this.

The state of modern physics reminds one of the story of the court astrologer who was explaining the Ptolemaic theory of the Universe to the King of Spain; when the sage finished his explanation of the epicycles and the epicycles on the epicycles, the King is said to have remarked, "If I were God, I would have made it simpler!"

It's not *all* wrong, just some of it. At best, it's incomplete. The relativists are seeking *something,* but are they really measuring what they think they are? The Universe always answers every question you ask of it, and it gives you the correct answer to your question. If the answer doesn't seem to make sense, perhaps it is because you did not understand the question yourself. It is not only "not nice to fool Mother Nature"; it is impossible.

We have gotten our view of the Universe screwed-up like this before, and the result was Newton, Maxwell, Einstein, Planck, and other brilliant generalists. Where are they today? Working quietly, I suspect, trying to make their new general theory include everything that we know to be workable to date.

Newtonian physics works. A whole body of useful engineering knowledge rests upon it, and the technology that results from it is working all around us right now. And it works well enough to permit us to navigate ourselves and our vehicles around the solar system.

Maxwell's equations work because radios transmit and receive, radar tracks us through the skies, and television entertains (?) us. Our homes and workplaces and buildings of public assembly are heated and illuminated by electromagnetic means.

Quantum mechanics works, in spite of the fact that Einstein himself had serious reservations about it, leading to his famous confrontation with Niels Bohr in 1927 when he asked the younger physicist whether Bohr could really believe that God played at dice. (Yes, there were discrepancies in the

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view of the Universe then as now, but they were not buried under as much paper in those days.) Quantum mechanics provides a pragmatic explanation for certain observed physical phenomena as well as providing a design tool for harnessing and utilizing these phenomena. Lasers lase and masers mase. Tunnel diodes work. Semiconductors conduct occasionally or just barely as desired.

In the areas of photoelectricity and nuclear energy, relativity has been vindicated by practice.

So none of these apparently incompatible views of the Universe is 100 percent wrong, but none of them is 100 percent right either to the exclusion of the others. The late Harry Schwartzberg of RCA Laboratories proposed the "Schwartzberg Test" that should be applied to any field of human endeavor whose practitioners desire to elevate to a science: "The validity of a science is its ability to predict!"

This echoes Lancelot Hogben: "A scientific explanation is one that is vindicated by practice."

Hogben also reminds us, "There is nothing particularly scientific about excessive caution. Science thrives on daring generalizations."

It is time for those daring generalizations and for the elegant experiments to back them up. The new general theory, whatever it is, must not only account for Newton, Maxwell, Einstein, and Planck, but must show that the work of these men is a special case of the new general theory. Where discrepancies and paradoxes exist, the new general theory must resolve them. And the new general theory must predict phenomena that the old laws and theories did not; these new phenomena must then be observed as the result of elegant experiments. An "elegant experiment" is one of the most difficult to design, but it is easy and inexpensive to conduct, its results are repeatable, it can be conducted by anyone, and the results are unambiguous. This is a tall order. Obviously, it is not going to be accomplished by crackpots or those uneducated and untrained in the physical sciences, and it is not going to be accomplished by those without imagination, daring, and more than a modicum of creativity. ("Creativity" has been succinctly studied and defined by Arthur Koestler as "the bisociative synthesis of random matrices," which means putting together two formerly unrelated systems to produce something that did not previously exist.)

All of the elements of the new general theory are there right now, and we are staring at them. We've observed their consequences and worked with them for a long time. They are used daily in all engineering work as the "Finagle Factor" that is plugged into the equation to make it work. But there is practically zero communication between the engineering arts and the physical sciences.

Where is the Twentieth Century Faraday that can look at a spinning gyro and see the miracle of star flight?

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Where is the modern Maxwell who can write the equations? Where is the Edison, the Bell, the Marconi, and the DeForest who will make it work? And where is the new Grand Generalist to put it all together in a better approximation to reality?

Most important, who will take the Copernican Risk to a career and reputation by defying the Keepers of the Faith? Who will dare challenge those whose interpretations of incomplete and imperfectly drawn theories would deny mankind the stars?

If we are to pay proper tribute to the memory of Albert Einstein in this, the centennial year of his birth, we should be looking for and receptive to new outlooks on the Universe that will complete the work he began and finish the task whose solution eluded him for more than fifty years. Just because Albert Einstein could not come up with a sweeping general theory does not mean that it is impossible. If we are to honor his memory, we must not look backwards and revere his work as Gospel; we must look forward and finish the basic work that he and his predecessors began: discovering a better approximation to reality. ■

Reading List

(N.B.: You do not have to believe what has been reported in this article; you can go and dig out the information yourself and therefore get it absolutely straight. If possible, read Newton, Maxwell, Einstein, and others in the original, not in the form of synopses and summaries written by someone else. It may take some searching to locate the originals, and it may be difficult to read and understand what you find. But if you approach it on any other level, you are taking somebody else's word, and he may have an axe to grind.)

Newton, Sir Isaac, *Philosophiae Naturalis Principia Mathematica,* originally published by Edmund Halley, London, 1687. (Original extremely rare, but you may be able to find a reprinted English translation.)

Maxwell, James Clerk, *Treatise on Electricity and Magnetism,* 1873.

Einstein, Albert, *The Meaning of Relativity,* 1923.

Builders of the Universe, 1932.

On the Method of Theoretical Physics, 1933.

The Evolution of Physics, 1938.

Shapley, H., Rapport, S., and Wright, H., *A Treasury of Science,* Harper, New York, 1946.

Runes, Dagobert D. (Ed.), *A Treasury of World Science,* Philosophical Library, New York, 1962.

Hull, Gordon Ferrie, *Elementary Modern Physics,* MacMillan, New York, 1949.

Koestler, Arthur, *The Act of Creation,* MacMillan, New York, 1964.

Murchie, Guy, *Music of the Spheres,* Houghton Mifflin, Boston, 1961.

(The *Encyclopedia Brittanica* is always good for a brief, highly edited, and greatly simplified overview.)

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the reference library

by SPIDER ROBINSON

(Beginning with this issue, "The Reference Library" will have two regular reviewers. Thomas A. Easton will do eight columns a year, while Spider Robinson will continue to do four. Publishers should send review copies directly to either Spider or Tom, at the following addresses: Spider Robinson, 1061 Wellington St., #6, Halifax, Nova Scotia, B3H 3AI, Canada; Thomas A. Easton, Box 316, RFD 2, Belfast, ME 14915.)

Index to Science Fiction Anthologies and Collections, William Contento, G.K. Hall, $28
Encyclopedia of Science Fiction and Fantasy, Vol II, Donald H. Tuck, Advent, 530 pp., $20
CDN SF&F, John Colombo, Michael Richardson, John Bell & Alexandre Amprimoz, Hounslow Press, 128 pp., $5.95
SFBRI, Vol. 8, H.W. Hall, 39 pp., $4.50
VOYA, Dorothy Broderick & Mary Chelton, $10 per year
In Memory Yet Green, Isaac Asimov, Doubleday, 732 pp., $15.95
In Search of Wonder, Damon Knight, Advent, 306 pp., $2.75
Heinlein in Dimension, Alexei Panshin, Advent, 204 pp., $4
The Science Fiction Novel, ed. Basil Davenport, Advent, 128 pp., $3.50
Science Fiction: An Illustrated History, Sam Lundwall, Today Press (Grosset & Dunlap), 208 pp., $7.95
Science Fiction, Robert Scholes & Eric Rabkin, Oxford, 258 pp., $2.95
The Wanting of Levine, Michael Halberstam, Berkley, 458, pp., $2.25
Universe 9, ed. Terry Carr, Doubleday, 182 pp., $7.95
Nightwings, Robert Silverberg, Avon, 190 pp., $1.50
Nightwalk, Bob Shaw, Dell, 160 pp., $1.75
Alicia II, Robert Thurston, Berkley, 419 pp., $10.95
Vector Analysis, Jack C. Haldeman II, Berkley, 195 pp., $8.95
The Drawing of the Dark, Tim Powers, Del Rey, 336 pp., $1.95
Black God's Shadow, C.L. Moore, Grant, 252 pp., price unknown
Alicia Austin's Age of Dreams, Grant, 139 pp., $25
Upon the Winds of Yesterday, George Barr, Grant, 139 pp., $25
The Forth Book of Virgil Finlay, ed. Gerry de la Ree, 128 pp., $15.50

What do you *mean,* "too wordy"? *Me*?

You see, the last Reference Library I wrote was in two parts and it came out so damned long that Stan had to cut it in half and run it serially. He has asked me to restrain myself to 5-6,000 words in future. This cramps me so considerably that I must ask you to forgive the absence of a lead: I simply have no room.

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This month's column, you see, has *four* parts . . .

The first two are primarily of interest to academicians, scholars, historians and teachers of SF, and their followers. The rest of you, bear in mind that I am none of the above, and still found all these books interesting enough to read. Without futher ado, then, Part One:

FACTS

The first book in this section is strongly recommended to anyone with more than a passing interest in SF: it is one of the two greatest wealths of useful data about SF ever made available.

William Contento's **Index to Science Fiction Anthologies and Collections,** edited by L.W. Currey and David G. Hartwell, is an enormous hardcover published by G.K. Hall, the people who put out the extraordinary Gregg Press series (SF classics in a hardbound format that will last a hundred years of repeated rereading—if, somehow, you don't know about the series, write to Gregg Press, 70 Lincoln St., Boston, MA 02111 for a free catalog). In it are indexed just about every SF antho or collection (including original anthos) printed in English before June '77—at least I have not spotted any omissions—by author, story and book. That is, you can find out, for instance, a) where to find any Sturgeon story ever anthologized or collected, b) *all* the places "Nightfall" has appeared over the years, or c) the table of contents of all three American versions of Groff Conklin's *Invaders of Earth,* and how they differ from the two British versions.

It covers 2,000 books, and 12,000 different stories by 2,500 authors. It runs 608 outsized pages full of small but quite readable computer type, logically laid out for easy reference, and I cannot imagine how I ever got along without it. The Contento *Index* is of enormous value not only to a reviewer and anthologist like me (my first antho, *The Best of All Possible Worlds,* should just be coming out from Ace as you read this), but to teachers, scholars, serious collectors and even casual frequenters of second-hand bookstores and used-magazine stacks.

Wherefore, I urge you not to wince and recoil when I tell you that the price is $28. It is worth twice that sheerly as an artifact—not hardcover but hard*bound*, printed on acid-free paper—and three times *that* as an information source. I've been using it almost daily for four months now, and have yet to find an error or typo. A stupendous achievement, deeply appreciated.

It is part of a series which Hall bills as "a core collection of reference publications for every library," and I'd have to agree. Other titles I have not seen yet include a similar *Index to Stories in Thematic Anthologies of SF* (aimed at teachers and librarians) by Marshall Tymn, Martin Greenburg, L.W. Currey and Joseph Olander; an annotated bibliography of *British and American Utopian Literature, 1516-1975* by Lyman Sargent; collected and bound (photocopies of) back-issues of *Locus, Extrapolation* and the British critical journal *Foundation*; and a two-volume collection of selected articles, *Science Fiction Studies,* edited by R.W. Mullen and Darko Suvin. Sight unseen I can recommend the *Locus* collection, one of the best sources of SF history as it happened, 1968-1977. (*Locus*, for those of you who just got off the star-

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ship, is the newspaper of SF, available at $9 for 12 issues from Locus Publications, PO Box 3938, San Francisco, CA 94119.)

The *other* "greatest wealth of useful data about SF ever made available" has to be Donald H. Tuck's massive **Encyclopedia of Science Fiction and Fantasy**, of which Advent:Publishers has recently released Volume Two, *Who's Who and Works, M-Z* (though how you could be a who who is who if you *don't* work is beyond me.)

Volumes One and Two essentially comprise a bibliographic survey of SF, fantasy and weird fiction through the year 1968, with biographical info thrown in whenever available (surprisingly often). Name any writer who worked in one of those three fields, and the Tuck *Encyclopedia* will tell you whatever is known about him or her biographically (often fascinating), then list every book he or she ever published —novels, collections, anthos, story-series, SF-related nonfiction, etc. There's even some space devoted to artists, although incomplete (you will search in vain for, say, Leo Summers or John Schoenherr, but you will find Alex Schomburg and Frank R. Paul).

In fact, there are only two reasons why Tuck's book does not clearly supersede Contento's as a reference source. First, its bibliographic data is limited to *books*, so it won't help you find individual stories unless the author collected them in a book. And second, it's current only through 1968, whereas Contento goes up to 1977. On the other hand, Contento does not cover novels, and offers no biographical info at all. You pays your money and takes your choice. (Me, I get review copies, and take *both*.) (On the other hand, you don't have to try and cram 10,000 words worth of opinions into a 6,000-word space. Wanna trade?)

With the eventual publication of Volume Three, Tuck's work will finally become a true encyclopedia (". . . many topics . . ."), furnishing data on magazines, pseudonyms, connected stories, and general information about SF. (It says here it will also list paperbacks by title, author and publisher, which confuses me: according to information on the same page, Volumes One and Two have already *done* two thirds of that work.) At that point, the three-volume set will unquestionably be a more valuable reference source than the Contento *Index*—and will cost somewhere between $25 and $35 more.

Howsomever, Tuck's scholarship is impeccable, his accuracy exemplary: his soon-to-be-completed encyclopedia is already a massive achievement, highly recommended.

Let me briefly give way here to chauvinism (in its proper sense—you'd be amazed how many people nowadays think "chauvinist" means a man who oppresses women) and bring to your attention **CDN SF&F: A Bibliography of Canadian Science Fiction and Fantasy**, compiled by John Robert Colombo, Michael Richardson, my good friend John Bell and Alexandre Amprimoz.

This is the first comprehensive bibliog of Canadian SF&F ever attempted, and an extraordinary job. It began as an appendix to Colombo's *Other Canadas: An Anthology of Science Fiction and Fantasy*, (McGraw-Hill Ryerson)—which I have not seen yet—and speedily grew to book size itself. It is classified into eight categories: science fiction, na-

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tional disaster scenarios (astonishingly popular with Canadian writers), polar worlds (a perhaps more predictable preoccupation), fantasy & weird tales (vastly outnumbering hardcore SF), French-language SF&F, children's literature, nonfiction, and works of Canadian interest by non-Canadians. When I say that the listings are complete I do not mean only that they have all three of my books, I mean that I will be astonished if anyone can come up with a title they've overlooked. I know that a good many of their citations prior to 1968 are unknown to Donald Tuck, who made a genuine effort to include non-U.S. publications. (The book is current to 1979, by the way.) There's even a reprint of a brief, hilariously pretentious 1942 essay by Donald Wollheim, commanding Canadian SF to find itself.

This next one is for critics, really hardcore scholars, and *very* cautious book-buyers . . .and oh, yes—*writers.*

In 1975 Gale Research Co. (Book Tower, Detroit MI 48226) published H.W. Hall's definitive **Science Fiction Book Review Index,** an updated compilation of Hall's own four-volume printing. I reviewed it at the time—but that was in another magazine (now a fanzine), and perhaps you weren't paying attention, and besides I just got the most recent update (Vol. 8, covering 1977), so I thought I'd bring it up again.

It is precisely what it says: index listings of SF book reviews published in 1977, keyed by author and by title. It offers access to 2,605 reviews of 1,495 books. Sixty-five sources are covered, including all the prozines, all the major fanzines, PW, and the *N.Y. Times Book Review* section. Marginal titles—for instance, Tom Robbins' *Even Cowgirls Get The Blues*—are included. If you want to know what the critics and reviewers had to say about a given book in 1977, all you need is this $4.50 volume plus either an *excellent* library or a complete private collection of back numbers of 65 sources. (To be fair, Hall provides current addresses for all sources still publishing.)

As I understand it, Gale is still selling the original 1923-73 volume (for $45), and Hall is privately printing and selling annual updates at $4.50 a hit. Write to SFBRI, 3608 Oak Meadows La., Bryan, TX 77801.

Of strong interest to Young Adult librarians, and more than peripherally related to SF, is **Voice of Youth Advocates,** or **VOYA,** a bimonthly 8½ x 11 journal for YA librarians available at $10 a year from Dorothy M. Broderick and Mary K. Chelton, 10 Landing La., Apt. 6M, New Brunswick, NJ 08901. I do not know Ms. Chelton, but Dorothy is a good friend, an ex-Haligonian and a rabid and knowledgable SF fan (she produced the first Halifax SF convention, Halcon I, two years back). Their journal, which averages 50 well-laid-out pages, is stuffed with articles, essays, reviews and checklists of SF. If you feel that your local library's selection of SF for young adults is rotten, that is, if you live near the average library, get them a subscription to *VOYA.* I feel quite strongly about this, because I discovered SF in the library myself, and pursued it there exclusively for the decade or so before I could afford to *buy* books of my own—very formative years.

I would love to give Volume One of Isaac Asimov's autobiography, **In Memory Yet Green,** a review in pro-

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portion to its massive size (over 700 pages!)—but there's no room, dammit, no room. Besides, by the time this sees print you'll likely have already seen several reviews of it elsewhere.

I will say that I sat down intending to skim very lightly through it—I mean, come on, 700 *pages* of somebody's memoirs—and looked up blinking to discover that it was two days later and I had read every word. It takes Isaac's life up to 1954, with sometimes brutal honesty, and I would guess that even someone who hates science fiction would find it fascinating in the extreme. It contains thirty-one photographs, and only half of 'em are of Isaac. I'm waiting with baited breath (I use a dry-fly on monofilament line) for Volume Two, which I hope will be titled, *In Memory Now Ripe.*

And since autobiographies (even Isaac Asimov's) are at least partly subjective, all this leads us smoothly to Part Two:

OPINIONS

There is a delicious satisfaction in affixing that title to this next section. I've recently been conducting an extended correspondence with another writer who pusillanimously wishes to remain nameless, in which he tries to convince me that objective criticism exists, and I explode his foolish arguments. He keeps speaking of "higher critical authority," and I keep chuckling. So it pleases me to label some of the critical milestones (did I spell that right?) of the field "opinions"—as, I hasten to add, are any judgements *I* make in these pages.

I read four books of SF criticism over the last few months (four more than usual), and the most significant was surely Damon Knight's **In Search of Wonder.** It is generally considered a classic, and I've been hearing and reading about it for years. (The edition I have was first published in 1967.) I enjoyed the book immensely, with two reservations.

First, I disagreed with Knight about 50 percent of the time about books I was familiar with, and about 20 percent of the time with opinions expressed about books I *hadn't* read. That's not all that important, though—it didn't really spoil my enjoyment, and it might even be a recommendation for some of you.

Second, I was made distinctly uneasy by the ferocity (and *constancy)* with which Knight went for the jugular. I know, I know, it was all for the good of the field, like a surgeon who must wade in blood in order to do his job. But I came away convinced that Dr. Knight frequently did either unnecessary, or unnecessarily radical, surgery, for the sheer bloodthirsty fun of it.

Still, I have to admit that it's brilliant, clever surgery, one of the most stimulating and provocative books about SF I've ever read. Knight has an uncanny knack of being able to see the naked bones of a story, and his praises are often as incisive as his putdowns. Both are entertaining and instructive.

Speaking of putdowns...

Advent: Publishers also sent me another book I had been hearing about for a decade and never happened to find when I had $4 to spare: Alexei Panshin's **Heinlein in Dimension.** It is billed as a critical analysis of Heinlein's work through 1967, and Donald Tuck's *Encyclopedia* describes it as "showing Panshin's admiration of

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Heinlein but without being blind to his faults." Damned if I see the admiration part anywhere: the impression I got was of a man trying desperately to pick any possible holes, large, medium or small, in the work (and what *he* perceives to be the philosophy and personality) of one of his betters. Having sampled his arguments, I'm prepared to concede that Panshin has probably read every work of Heinlein's at least once—but I won't swear he was always paying attention.

In discussing the classic story "Gulf," for instance, Panshin lists nearly a full page of questions he says the story fails to answer. A thoughtful reading of the story answers every single one of them. Again, in dismissing *The Moon Is a Harsh Mistress,* he actually criticizes Heinlein's use of the imaginary and imaginative dialect called "Loonie," for three different, equally stupid reasons. Let us consider only the third: "...it is a fact that the narrator is the only character in the book who speaks this artificial jargon." No, it is not either a fact. What is a fact is that few of the characters with speaking parts are third-generation lower-class Loonies like the narrator; most of them are Earth-born and -educated or trying to sound like it. But every character who *does* share Manny's background and upbringing—and there are several—*does* speak the dialect. Right there in b&w—all he had to do was look.

Panshin does accidentally hit upon some interesting insights into Heinlein's work here and there, and does put an occasionally accurate finger on some of Heinlein's literary weaknesses. But you would have to do what he obviously did not—read Heinlein, carefully—to tell the difference.

Another Advent publication, of special interest to historians of SF, is **The Science Fiction Novel,** a slim collection of four essays based on speeches made by SF writers at the University of Chicago in early 1957, edited and foreworded by Basil Davenport. They are: Robert A. Heinlein on "Science Fiction: Its Nature, Faults And Virtues"; Cyril M. Kornbluth on "The Failure of the Science Fiction Novel As Social Criticism"; Alfred Bester on "Science Fiction and the Renaissance Man"; and Robert Bloch on "Imagination and Modern Social Criticism."

To my mind the two most interesting were the Heinlein, in which he made his famous and still-controversial attempt to define and distinguish science fiction and fantasy, and the Kornbluth, in which poor pessimistic Cyril (who knew he was dying) argued that if SF *is* social criticism, then it fails, having had no visible effect whatsoever on society. I think he was simply using too short a time scale and insufficiently subtle measuring instruments—I think if he were still alive he might by now have changed his mind at least a little—but I enjoyed his arguments. Bloch's piece includes an incisive indictment of some common fascist assumptions of SF, which the field itself was already beginning to question at that time; the Bester speech reads like one of those where You Had To Be There.

Altogether an absorbing and thought-provoking volume, recommended.

Sam J. Lundwall is indeed a redoubtable commentator: I doubt him every time he opens his mouth. Lundwall is a

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Swedish SF fan who has never forgiven North America for taking over SF. His latest attempt to punish us is the bogus **Science Fiction: An Illustrated History**, a slipshod collection of irrelevancies, misinformation and some of the worst SF art ever perpetrated, designed to prove that European SF is the only *real* SF. I am prepared to agree that most historic treatments of SF err in making it appear almost exclusively an American and British phenomenon—but here Lundwall has clearly flung baby after bathwater. A survey of European SF—*so labeled*—would be a valuable book indeed, if one could trust it. But in dismissing all but a smidgin of English-language SF (with which he claims to be equally familiar), Lundwall reveals an ignorance so massive, and a bias so exaggerated, as to render suspect his perceptions of European SF too.

Examples: "The annual 'World SF Conventions'...are not international in any sense of the word, just local meetings for American fans." Including the ones in London, Toronto, Melbourne, Heidelberg and Brighton? Lundwall characterizes 1951 as a year "when science fiction everywhere was at an all-time low." This may, for all I know, have been true elsewhere in the world—but in America, where *Galaxy* and *F&SF* and a couple dozen other new magazines were revolutionizing the Campbell-dominated field and book-publication was booming, it was emphatically *not* so. By Lundwall's lights, *Dracula* was science fiction, and *Pinocchio* was a robot story (in a 28-page chapter on robots, he dismisses Isaac Asimov in two paragraphs, as a man who "made robots suitable as good company, but...also made them somewhat boring and predictable"!). On p. 83 he asserts that no dystopian novels have been published in the West since Pohl & Kornbluth wrote *Gladiator-At-Law*.

How a book which dismisses Heinlein, Sturgeon and Asimov in less than a paragraph each, and never once mentions Bester, Niven, Anderson, Silverberg, Delany, Pangborn, Ellison, Tenn, or the solo work of Cyril Kornbluth, can bill itself as a "history of SF" is beyond me.

For fanatic anti-Americans only.

Of infinitely more use to teachers of SF courses is **Science Fiction: History, Science, Vision**, by Robert Scholes and Eric S. Rabkin. Subdivided into the three parts of its subtitle, it offers a brief literary history of SF (much less detailed, and infinitely less irrelevant, than Lundwall's listing of anything

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remotely fantastic or Utopian) through 1976, essentially beginning with *Frankenstein;* brief discussions of some of the scientific knowledge necessary to an appreciation of SF; and a study of some of its classic forms and themes, illustrated by discussion of ten representative novels (interestingly, only two, *A Canticle for Leibowitz* and *The Left Hand of Darkness,* are by American writers).

Brief is the key word here: Scholes & Rabkin would otherwise have produced a book too massive for classroom use. There are some points I quarrel or quibble with, inevitably, but overall I agree with Joe Haldeman's blurb-quote: "The summary that Scholes & Rabkin present manages to be lucid without oversimplifying." They cover several non-English language writers, including Borges, Calvino, Capek, Zamyatin, the Strugatskis and Lem, and even cite Sam Lundwall's mediocre novel, *2018 A.D. or The King Kong Blues.*

Speaking of Lundwall, our next category is:

FICTION

I think it's a safe bet that both the author and publisher will be horrified to hear me say this—but I maintain that Michael Halberstam's mainstream bestseller, **The Wanting of Levine,** is an SF novel. Furthermore, it's one of the best I've read this year.

Some will deny that *Levine* is SF. True, it takes place a mere decade in the future; furthermore the only significant changes mentioned in America are changes in political climate (the U.S. has become a second-rate power; Mexico is seriously considering declaring war, etc.). But I think those are enough to qualify the book as SF, and here's my prime argument...

My wife Jeanne and I published a novel-excerpt, "Stardance II," in these pages last year; as it won the annual AnLab poll, I think it's safe to assume you've read it. One of its characters was a blackguard politician named Silverman, whom we described as having failed to become President only by some very subtle errors. We got a letter of criticism from a fan (himself Jewish) complaining *not only* that Silverman's characterization was anti-Semitic (helping to inspire Stan's recent editorial, "Equal Rights for Dumb Blondes"), but that it was absurd to suppose a Jew could even come *close* to the presidency in a mere twenty years (one of the few examples I know of simultaneous anti-Semitism *and* anti-gentilism).

For that correspondent, *The Wanting of Levine* is clearly an SF novel—for it plausibly portrays the election of the first Jewish President—an ex-traveling salesman and admitted multiple-adulterer—in 1988.

One brief anecdote from this quietly hilarious and altogether marvelous novel: Levine, a presidential candidate, is being wined and dined by a caucus of wealthy black politicians whose support he seeks (although they have never yet endorsed a white candidate). The meal is lavishly opulent—but when Levine's chateaubriand arrives, it tastes foul beyond belief. Not enough of a political animal to keep quiet and tactfully eat a few bites anyway, Levine remarks to his seatmate that his steak tastes rotten. The seatmate, to Levine's embarrassment, forces him to announce this to the table at large—but when he does, to his astonishment they

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all break into broad grins for the first time, applaud, and slap him on the back. "There's an old saying in the South," one of them gleefully tells him, " 'If a man don't know horseshit, what does he know?' "

Just *think* of the fun they must have had at the *last* three or four dinners!

There's a marvelous subplot which eventually forces Levine, like Abraham, to choose between his conscience and the life of his son, and some superb characterization, and many simply unforgettable scenes, and all in all I intend at this point to nominate *The Wanting of Levine* for the Best Novel Hugo next year. On no account miss it.

Similarly, Terry Carr's original antho **Universe 9** contains what will almost certainly be 1979's best novelette, John Varley's "Options"—the best Varley I've read since "The Persistence of Vision."

Some things—like the Norelco coffeemaker or the slant-six engine—are, as Heinlein said, so perfect that the only possible improvement is a radical change in design. In which case you are talking about something else altogether. In "Options," Varley has written the definitive sex-change story.

Having for several years written about a future in which people change their sex as casually as their underwear, Varley finally got around to writing about the *transition period,* when gender-bendering is an option available but not yet fully accepted. His story concerns a woman increasingly intrigued by the idea, married to a man who feels personally threatened by it. How Varley could so exhaustively explore the subject in a mere novelette—and still have room for characterization expert enough to leave me literally weeping at the end—is more than I can explain. I *can* predict that one day it will be one of the most famous and frequently reprinted stories in the history of SF.

Also especially notable are Bob Shaw's SF murder-mystery, "Frost Animals"; a marvelous almost-Utopia story by Paul David Novitski, "Nuclear Fission"; a stunning Greg Benford short called "Time Shards"; and Marta Randall's "The Captain and the Kid." And I particularly enjoyed "The Back Road," a whimsical fantasy which is the first published story of Mary Pangborn, sister of the late great Edgar Pangborn (one of the five greatest writers who ever worked this genre). Mary's story shows that she may just be every bit as good as Edgar was, and I'd need at least a whole column to tell you how good that is. I only actively disliked one story, John Shirley's overwritten and underthought-out "Will the Chill," and even it had some nice touches.

Only a fool would pass up a Terry Carr anthology—but *Universe 9* is even more outstanding than usual. I'd go for the Doubleday hardcover on this one—you'll want to reread it many times, and Varley's story alone is worth eight bucks. (Quickly now: what do you call a nun who's had a sex-change? *A transister.*)

I greatly admire an awful lot of Bob Silverberg's work, but for various reasons it chanced that I never got around to reading **Nightwings** until the most recent reprint arrived a few months ago. The first portion of it won the 1968 novella Hugo and made the Nebula list; another portion was nominated for both Hugo and Nebula

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the next year; it is an "acknowledged SF classic." Consequently nothing I say about it at this point is liable to damage its reputation any—but I have to say I found it possibly the most *annoying* SF novel I've ever read. Would one of you out there who liked it so much please explain to me how you got past the literally dozens of implausibilities, impossibilities and inconsistencies in it? Ignoring for the moment the fact that the protagonist is a monumentally boring dullard?

By the end of the first, Hugo-winning portion, for instance, I wanted urgently to know: 1) why the Watcher DEW system was devised, when it is so obviously worthless? 2) what Gormon's *mission* was supposed to be, why he tipped off the narrator about the invasion, why he immediately abandoned his beloved flier Avuela, why he did *any* of the things he did, and how he got to Earth without being spotted by Watchers? 3) why in God's name the Prince took a concubine along to a dogfight, and why his antistarship vehicle incorporates a canopy transparent to visible light (such as a laser beam)? 4) how a planetary defense system with such a stupid, ineffectual DEW-network could work so well that it took all night for "hundreds of starships" to reduce each city? 5) why there are no *minor* cities anywhere on Earth? 6) how, if the blinded Prince must be careful to avoid capture by the aliens, he ever escaped them after his blinding in the first place? 7) why in *hell* the aliens would cross interstellar space to conquer a planet with few people and next to no reclaimable resources—and then do nothing whatsoever *with* or *to* it? (that hokey thousand-year-old grudge? Then why no revenge?) And, 8) in a world rigidly divided into guilds, each with a hard, practical purpose (there don't seem to be singers' or poets' or artists' guilds), what was the *purpose* of the Fliers' Guild?

From there it got worse with every page, especially in the outstandingly dumb history of How The World Got That Way: with interstellar travel dirt-cheap, the human race (at the height of its power) chose to test its first planetary-scale weather-control machine on *Earth?* And was decimated when it went wrong? I mean, come *on* now.

I confess myself completely baffled by the enormous popularity of this book. On virtually every page I was forcibly reminded that I was sitting in a chair reading a book—and an incredibly implausible one.

You *see,* dammit? I'm nearly out of room already, and there are still dozens of books I want to talk about—one whole *section* I'm going to have to truncate. Once again I am forced into unsatisfactory mini-reviews.

Nightwalk, by Bob Shaw: reprint of a very good novel about a blinded secret agent who must extricate himself from extreme hot water with the dubious help of a device which allows him to see *through other men's eyes only.* Not a perfect book—the ending is a little pat and contrived—but enormously inventive, absorbing and . . . ahem . . . eye-opening.

Alicia II, by Robert Thurston: forgive him the ill-advised *Cattlecar Galactica* novelizations (he tried hard, but as William Goldman once said, you can't wash garbage), and consider this an extraordinary first novel; about a man privileged to become a

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"retread" (brain-transplanted into a new young body) who discovers that his new body's disgruntled previous owner irreversibly sabotaged it—in the gonads.

Vector Analysis, by Jack C. Haldeman II: the long-awaited first novel by Joe's older brother. In a style distinctly different from his brother's (and arguably as good), Jay manages to blend many ingredients—exobiological disaster, plausible aliens, technological extrapolation, pulse-pounding suspense (little pun there), and a good love story—into a satisfying, balanced novel.

The Drawing of the Dark, by Tim Powers: Arthurian sword & sorcery involving Suleiman's siege of Vienna in 1529, and featuring as protagonist a delightful Irish rogue adventurer who learns to his dismay that he is the reincarnation of King Arthur. Powers is still learning his craft, but displays enormous natural story-telling skills.

Black God's Shadow, by C.L. Moore: five of the six Jirel of Joiry stories (excluding the Kuttner collaboration), swashbuckling sword and sorcery—with a female protagonist. Classic fantasy, here reprinted with the finest possible binding, paper and editorial supervision by specialty publisher Donald M. Grant (West Kingston, RI 02892). Features six full-color, removable-plate (no puns about dentures, please) illustrations by Alicia Austin, which leads us rather smoothly to our squashed last section:

ART

Don Grant's particular interest is fantasy art, and he has produced two extraordinary collections in **Alicia Austin's Age of Dreams** and George Barr's **Upon the Winds of Yesterday.**

The Austin is a roughly equal mix of color and b&w. If it were any other publisher (except Gerry de la Ree) I'd suspect poor repro; but since it's Don, I conclude that Austin has a fondness for monochrome effects. Her two strongest influences appear to be Michaelangelo and Aubrey Beardsley, and she clearly deserved her 1971 Hugo.

The Barr is almost all full-color paintings—fewer renderings than the Austin but a bit more to my own taste, for whatever that's worth: a more "modern" style and more *feeling* to them. Barr also deserved his 1968 Hugo, and his subsequent annual nominations. There's an element of whimsical humor in his work that reminds me of Kelly Freas at his best.

Like all Don Grant publications, these are both limited editions carefully reproduced on excellent paper and bound well enough to last a lifetime.

Likewise **The Fourth Book Of Virgil Finlay.** A few months ago, in reviewing Gerry de la Ree's (7 Cedarwood Lane, Saddle River, NJ 07458) *third* Finlay collection, I said that one would have expected Gerry to by now have run out of *prime* Finlay and begun trotting out the second-rate filler. Well, 120 plates later, it hasn't happened yet. There's less stipple and cross-hatching intricacy (by 1955 Finlay was working for different markets), but just as much sheer talent. This completes Gerry's four-volume survey of Finlay's work. Like the Grant books, it's a superb production job and a strictly limited edition.

Well, how about it, Stan? Did I come in under the length limit *this* time, or did I blow it and run over once again, despite all of my best int

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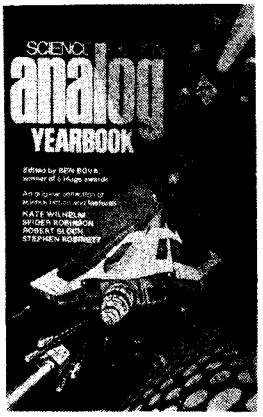

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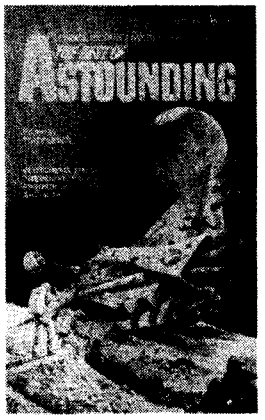

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